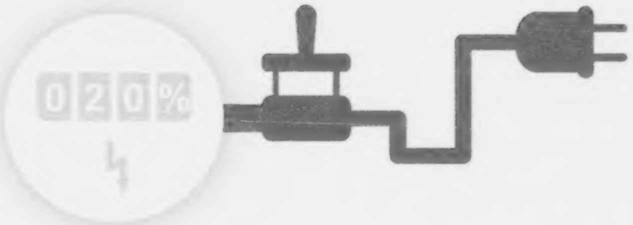
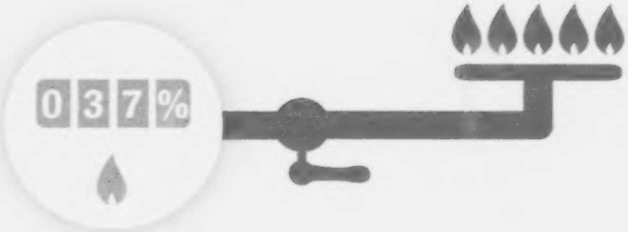
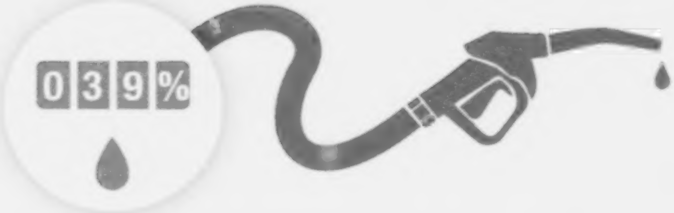
Every Joule Counts

Ontario's Energy Use and Conservation Year in Review







Environmental
Commissioner
of Ontario

Annual Energy Conservation Progress Report
2016/2017 (Volume Two)

List of Acronyms

APS	Achievable Potential Study
BMG	Behind-the-Meter Generation
CBDR	Capacity Based Demand Response
CDM	Conservation and Demand Management
CFF	Conservation First Framework
CHP	Combined Heat and Power
DR	Demand Response
DSM	Demand Side Management
ECO	Environmental Commissioner of Ontario
EGD	Enbridge Gas Distribution
EV	Electric Vehicle
FIT	Feed-in Tariff
GAM	Global Adjustment Mechanism
GDP	Gross Domestic Product
GGRA	Greenhouse Gas Reduction Account
GHG	Greenhouse Gas
GJ	Gigajoule
GTA	Greater Toronto Area
GWh	Gigawatt hour
HDD	Heating Degree Day
HVAC	Heating, Ventilation and Air Conditioning
IAP	Industrial Accelerator Program
ICI	Industrial Conservation Initiative
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kt	kilotonne
kWh	kilowatt hour
LDC	Local Distribution Company
LRP	Large Renewable Procurement
LTEP	Long-Term Energy Plan
m^3	cubic metre
MENG	Ministry of Energy
Mm^3	Million cubic metres
MMA	Ministry of Municipal Affairs
MOECC	Ministry of the Environment and Climate Change
MOI	Ministry of Infrastructure
MOU	Memorandum of Understanding
MTO	Ministry of Transportation
MW	Megawatt
MWh	Megawatt hour
OBC	Ontario Building Code
OEB	Ontario Energy Board
OPA	Ontario Power Authority
OPG	Ontario Power Generation
OPS	Ontario Public Service
P4P	Pay for Performance
PAC	Program Administrator Cost
PJ	Petajoule
PSU	Process and Systems Upgrade
RNG	Renewable Natural Gas
RPP	Regulated Price Plan
tCO_2e	tonne of Carbon Dioxide equivalent
TOU	Time of Use
TRC	Total Resource Cost
TWh	Terawatt hour

Environmental
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of Ontario

Commissaire à
l'environnement
de l'Ontario

August 2017

The Honourable Dave Levac
Speaker of the Legislative Assembly of Ontario

Room 180, Legislative Building
Legislative Assembly
Province of Ontario
Queen's Park

Dear Speaker,

In accordance with my mandate under section 58.1 of the *Environmental Bill of Rights, 1993*, I am pleased to present Volume Two of the 2016/2017 Annual Energy Conservation Progress Report of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario.

The 2016/2017 Annual Energy Conservation Progress Report, my independent review of Ontario's progress in conserving energy, has been issued in two separate volumes.

The first volume, entitled *Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use* was released on May 30, 2017, and examined opportunities to reduce the energy and carbon footprint of Ontario's municipal water and wastewater systems.

This second volume, entitled *Every Joule Counts: Ontario's Energy Use and Conservation Year in Review*, provides a broader review of progress on energy use and conservation activities in Ontario.

Yours truly,

D Saxe

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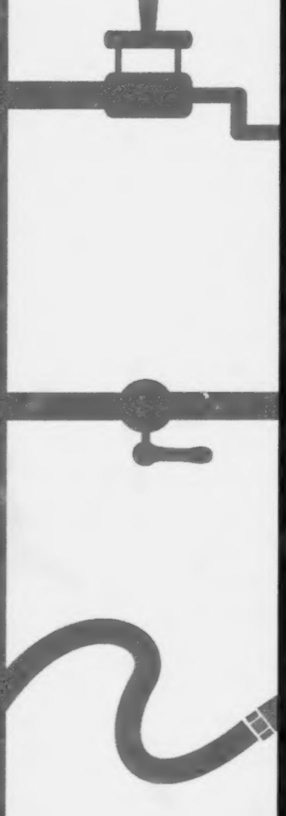

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Executive Summary

Introduction (Chapter 1)

Every Joule Counts is Volume Two of the ECO's annual energy conservation progress report. This report is Ontario's only comprehensive public summary of energy conservation and efficiency.

The time frame covered by the report is by necessity a hybrid. Final numerical data on overall energy use and energy conservation is presented as of year-end 2015, except as noted. This is because 2015 data is the most reliable set of data across the sector. This is due to the time lag in data collection and reporting, as well as the need for evaluation prior to verifying final results of conservation programs. The report's description of policy developments, including policies that affect conservation program activity, is complete to the end of 2016.

Utility programs for conservation of natural gas and electricity are covered in detail; there is no equivalent program for petroleum products conservation to report on.

Energy Use in Ontario (Chapter 2)

Despite population and economic growth, Ontario's overall energy use did not change significantly from 2014 to 2015; in other words, Ontario continues to improve its energy efficiency, as it has done since 2007.

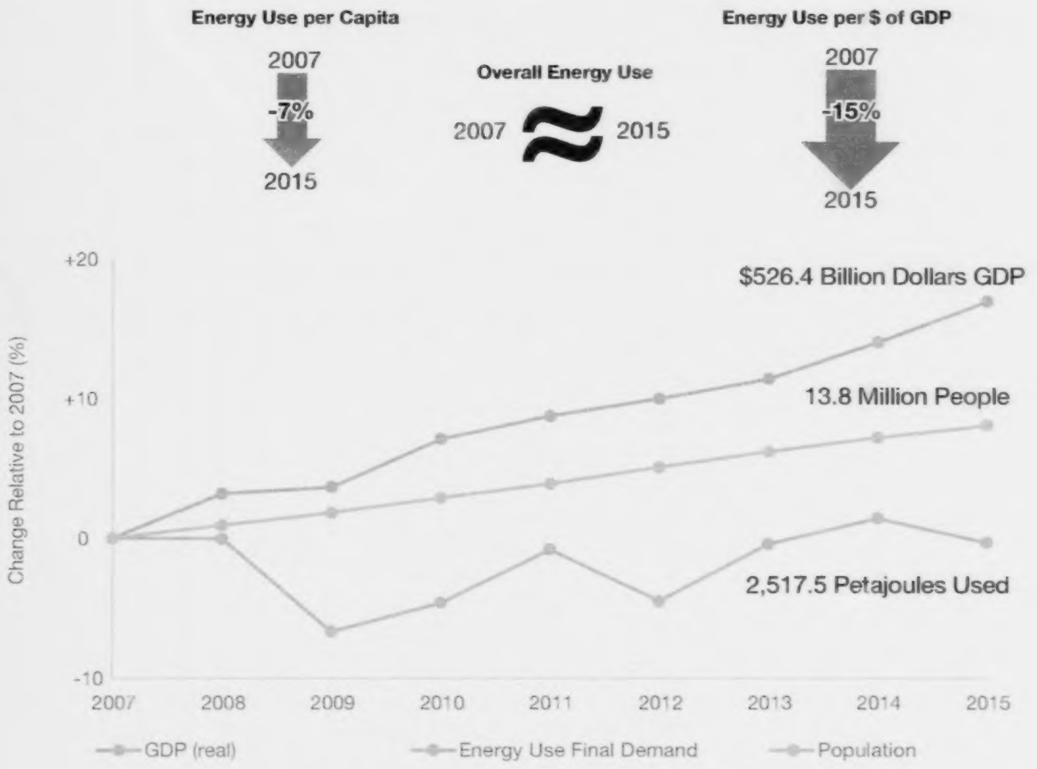


Figure 2.2. Ontario's overall energy use, population and GDP (2007-2015).

The ECO estimates that the electric and gas conservation programs offered since 2006 (by the Independent Electricity System Operator and electric and gas utilities) have reduced overall energy use in 2015 by 3%.

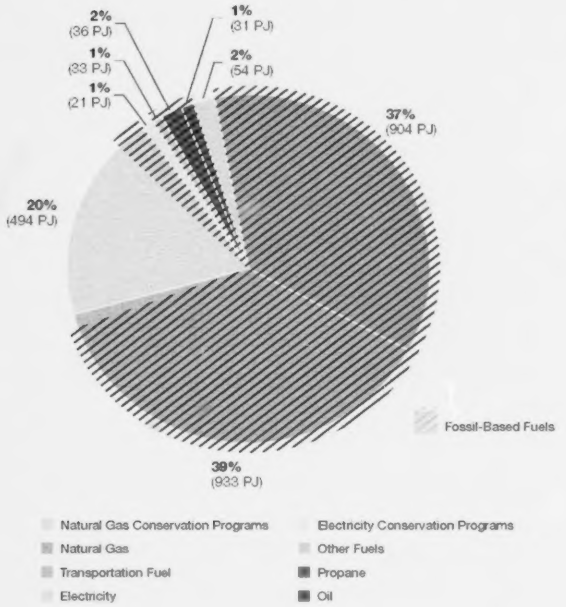


Figure 2.1. Share of overall fuel demand in Ontario, by fuel type, including demand reduced by utility-run conservation programs (2015).

The potential for further energy efficiency in Ontario is substantial. A reduction of over 25% in electricity and natural gas use is economically achievable by 2030, and by 2025 new vehicles sold in Canada will be 50% more efficient than they were in 2008. However, given the dominant role of fossil fuels in Ontario's energy mix, efficiency alone will not be enough to meet the province's greenhouse gas reduction targets. Significant fuel switching to cleaner, non-carbon based fuels will also be needed.

This will require policy intervention since Ontario's electricity is much more expensive than natural gas and electric vehicles are more expensive than petroleum-fueled vehicles.

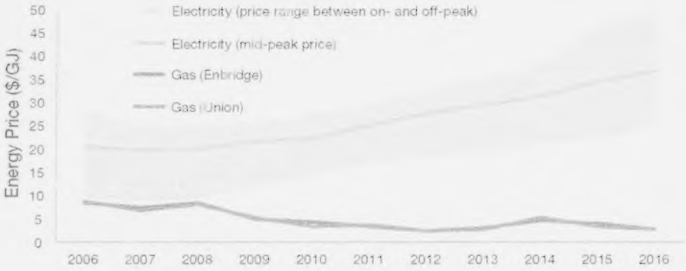


Figure 2.4. Ontario's annual residential time of use electricity prices compared to natural gas prices, per gigajoule (2006-2016).

Note: Does not include cost of delivery to end user.

Fuel-by-Fuel Trends

From 2014 to 2015, transportation fuel use increased by 2% (likely influenced by 16% lower gas prices), and natural gas use decreased by 4% (partly due to a warmer winter and conservation programs). Though electricity use remained almost the same, the supply mix has changed, with more generation from natural gas and renewable energy in 2015.

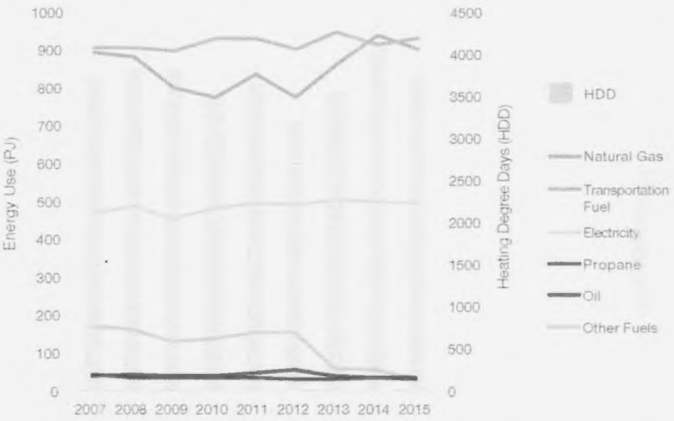


Figure 2.3. Ontario's energy use by fuel type in petajoules, and southern Ontario heating degree days (HDD) (2007-2015).

Ontario Energy Policy in 2016 (Chapter 3)

The energy file in Ontario was very active in 2016, with a **tighter linkage between energy and climate policy** influencing most of the year's actions. Some of the most important energy developments in Ontario in 2016 were:

1. A law to implement **carbon pricing** through a cap and trade system, and a *Climate Change Action Plan* to further reduce greenhouse gas emissions, in part using revenues from cap and trade. Ontario consumers of fossil fuels began paying a carbon price as part of their energy costs as of January 1, 2017.

2. A new legal framework for energy system planning, and the initiation of an updated **long-term energy plan encompassing all fuels**. The legal requirement for an Integrated Power System Plan developed by the Independent Electricity System Operator has been removed, and the Ministry of Energy now has full control over the energy plan.

3. Actions to move **electric vehicles into the mainstream**, through incentives, public charging infrastructure, and new Building Code requirements. Electric vehicle uptake in Ontario has been slow, with just under 10,000 electric vehicles on the road in Ontario at the end of 2016.

4. Completion of a co-ordinated land-use planning review, followed by proposed changes to provincial **land use plans that focus on intensification and integration of transit**. Amendments are intended to build complete communities that will reduce energy use for personal transportation.

5. **Ownership changes of Ontario's energy utilities**, including the continuing government sale of Hydro One, the merger of four large electricity distributors into a new distributor (Alectra) that will be the second largest in Ontario, and the planned merger of the parent companies of Ontario's two large gas utilities (Enbridge Gas Distribution and Union Gas).

6. Full implementation of **new conservation frameworks for electricity and natural gas**, with new programs, targets, and budgets (conservation results are reviewed in detail in Chapters 5 and 6).

7. Initial steps to increase production and use of **natural gas from renewable energy sources**. The Minister of Energy wrote to the Ontario Energy Board to confirm interest in incorporating renewable natural gas into Ontario's natural gas supply. The Board is currently developing a framework to do so.

8. **Refurbishment of Ontario's nuclear fleet**, beginning with the shutdown of a unit at Darlington in October 2016. Refurbishments at Darlington and Bruce stations are to be staged over a period of almost 20 years, and the Ministry of Energy has approved plans to extend the life of the Pickering station from 2020 to 2024. The Ontario Energy Board is currently reviewing an application for cost recovery associated with the Darlington refurbishment and Pickering extension.

9. **Changes to renewable electricity procurement**, including a contract for hydroelectric imports from Quebec, a freeze on new large-scale renewable electricity projects, and a transition of small-scale renewable projects to net metering.

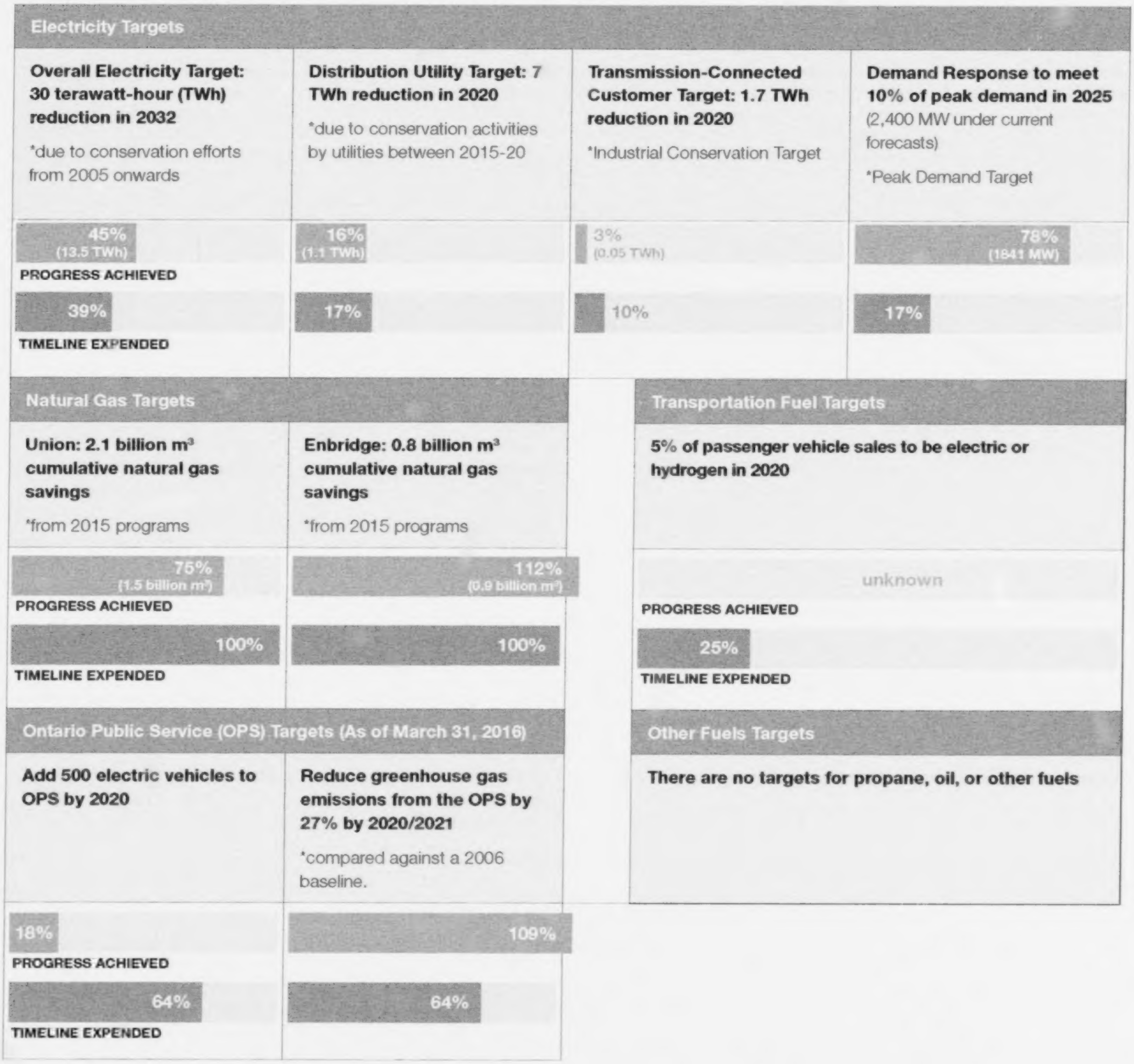
10. Some **electricity price relief** was provided to consumers, including the removal of the Debt Retirement Charge and the rebate of the provincial portion of the Harmonized Sales Tax for residential customers. In 2017, the Ministry of Energy took further action to reduce residential electricity bills through the "Fair Hydro" plan.

Progress on Conservation Targets (Chapter 4)

Progress towards government-established energy conservation targets is reported as of December 31, 2015, unless otherwise indicated.

Most initiatives are roughly on pace to meet their target. **The government has already met its target to reduce greenhouse gas emissions from the Ontario Public Service** by 27% in 2020/2021, compared against 2006. The province is also far ahead in its efforts to use demand response measures to reduce peak electricity demand. However, much more effort will be needed to meet the province's target for reducing electricity use among large industrial transmission-connected customers.

PROGRESS ON ONTARIO'S ENERGY CONSERVATION TARGETS
(As of December 31, 2015, unless otherwise indicated)



Electricity Targets

Overall Electricity Target: 30 terawatt-hour (TWh) reduction in 2032
*due to conservation efforts from 2005 onwards
Progress achieved: 45% (13.5 TWh)
Timeline expended: 39%

Distribution Utility Target: 7 TWh reduction in 2020
*due to conservation activities by utilities between 2015-20
Progress achieved: 16% (1.1 TWh)
Timeline expended: 17%

Transmission-Connected Customer Target: 1.7 TWh reduction in 2020
*Industrial Conservation Target
Progress achieved: 3% (0.05 TWh)
Timeline expended: 10%

Demand Response to meet 10% of peak demand in 2025 (2,400 MW under current forecasts)
*Peak Demand Target
Progress achieved: 78% (1841 MW)
Timeline expended: 17%

Natural Gas Targets

Union: 2.1 billion m³ cumulative natural gas savings
*from 2015 programs
Progress achieved: 75% (1.5 billion m³)
Timeline expended: 100%

Enbridge: 0.8 billion m³ cumulative natural gas savings
*from 2015 programs
Progress achieved: 112% (0.9 billion m³)
Timeline expended: 100%

Transportation Fuel Targets

5% of passenger vehicle sales to be electric or hydrogen in 2020
Progress achieved: unknown
Timeline expended: 25%

Ontario Public Service (OPS) Targets (As of March 31, 2016)

Add 500 electric vehicles to OPS by 2020
Progress achieved: 18%
Timeline expended: 64%

Reduce greenhouse gas emissions from the OPS by 27% by 2020/2021
*compared against a 2006 baseline.
Progress achieved: 109%
Timeline expended: 64%

Other Fuels Targets

There are no targets for propane, oil, or other fuels

Natural Gas Conservation Programs (Chapter 5)

Natural gas supplies about 37% of Ontario's energy needs. Reducing natural gas use through conservation is important for reducing energy bills and for climate change mitigation.

This chapter reviews 2015 conservation program results (the most recent results available) from Ontario's two major natural gas utilities (Enbridge Gas Distribution and Union Gas), and policy developments in 2016 that directly affect utility conservation programs.

2015 Results

2015 results have yet to be verified and approved by the Ontario Energy Board and could still change significantly. Based on draft results, overall natural gas savings for Union Gas were down 17% from 2014, primarily due to a drop in savings from large industrial customers. Enbridge's results were 20% higher than in 2014, due to higher savings from commercial and low-income customers.

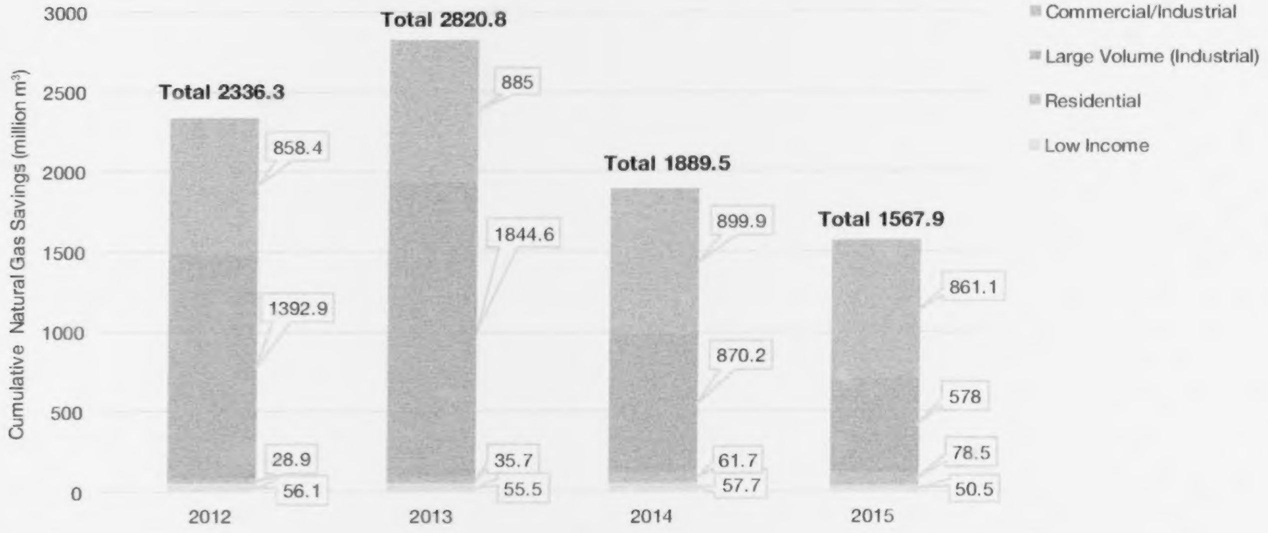


Figure 5.1. Union Gas cumulative natural gas savings from conservation programs, by sector (Ontario, 2012-2015)

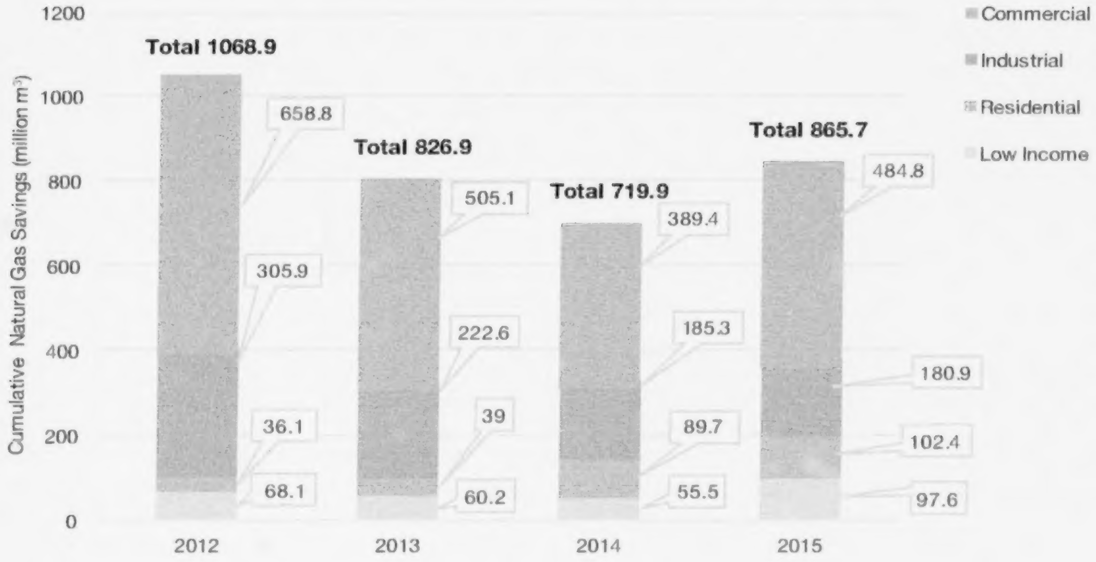


Figure 5.2. Enbridge Gas Distribution cumulative natural gas savings by sector (Ontario, 2012-2015)

Both companies have programs in the residential, commercial and industrial sectors. In the residential sector, the focus is on deep home retrofits, a program that has grown rapidly in recent years. Both companies also offer programs to low-income residents, at low or no cost to participants. The largest savings come from commercial and industrial customers. However, given the higher cost of electricity, these customers often favour electricity conservation programs over natural gas programs as the financial rate of return is higher. This puts natural gas at a conservation disadvantage.

Total conservation spending for both utilities was $68 million in 2015. Cost-effectiveness testing showed that **natural gas utility conservation programs make good sense – delivering roughly three dollars in benefits for every dollar spent.** For the first time, the cost-effectiveness test includes a 15% non-energy benefit adder to recognize the environmental, economic and social benefits of conservation.

Burning less natural gas reduces greenhouse gas emissions. Each year gas conservation programs have avoided approximately 0.2% of Ontario's annual GHG emissions (300,000 tonnes per year). The average abatement cost of conservation from the utility perspective (not even including the savings from purchasing less natural gas) has been around $15 per tonne of carbon emissions, cheaper than the current cost of allowances in the cap and trade program.

2016 and Beyond

In a carbon-constrained economy, gas conservation makes even more sense. This has been reflected in the new six-year conservation framework and expanded budget for natural gas conservation. While 2015 was officially the first year of the new framework, it served in reality as a transition year that rolled over programs and budgets from 2014. Conservation budgets for both gas companies combined will increase significantly to just under $120 million per year, beginning in 2016. This is still much less than is spent on electricity conservation.

Given its climate mitigation potential, funding for gas conservation is also being made available by the Ontario government from cap and trade proceeds. Careful oversight will be needed to ensure that these initiatives do not conflict and that utility programs continue to be delivered effectively.

Electricity Conservation Programs (Chapter 6)

The 2015-2020 Conservation First Framework (CFF) was established in a 2014 Minister of Energy Directive. The framework mandates that each Local Distribution Company (LDC) reduce electricity consumption by offering conservation programs to its individual customer segments "as far as is appropriate and reasonable". This was expected to give LDCs more flexibility to align their programs with local needs.

The Directive stipulated that energy savings would be counted on the basis of persistence throughout the course of the framework (i.e., only conservation measures still delivering savings at the end of 2020 will count towards targets). **Short-term reductions in electricity are less critical over the next few years, given the province's strong short-term supply position. Longer-lasting conservation projects have more value, as they will help avoid new generation in future years.**

Previously, LDC conservation programs were required to deliver both overall electricity savings and (the more difficult and critical) reduction in electricity use at times of system peak. However, **reducing peak electricity demand is now solely the Independent Electricity System Operator's (IESO's) responsibility,** and was moved to a market-based auction system starting in late 2015.

The Value of Conservation

The province is about halfway through its second multi-year conservation framework, and conservation remains the cheapest form of energy. The cost of conservation comes in at 3.5 cents/ kWh compared to renewable generation (hydro, wind and bio energy) at 6.5-26 ¢/kWh, hydro generation at 12-24 ¢/kWh, nuclear generation at 12-29 ¢/kWh, and 8-31 ¢/kWh for gas generation. In 2015, a total of $429 million was recovered from Ontario's ratepayers through the Global Adjustment Mechanism (GAM) for conservation. This is about 4.3% of the total GAM charged on electricity bills in 2015 and about 2% of the total electricity cost. These percentages are in line with previous years. Therefore, **conservation is still adding significant value at a very low cost** and will become more critical as nuclear refurbishments and (eventually) the Pickering shutdown get underway.

Overall Performance

In 2015, the transition between frameworks went smoothly. The province's LDCs achieved 1,117 GWh of net energy savings, which represents 16% of their 6-year target. As such, LDCs collectively are on pace to meet their 2020 target. Of these savings, 94% can be attributed to conservation programs from the 2011-2014 CDM framework that were started in 2014 but completed in 2015. Between 2014 and 2015, there was a 5% increase in reported incremental first year energy savings.

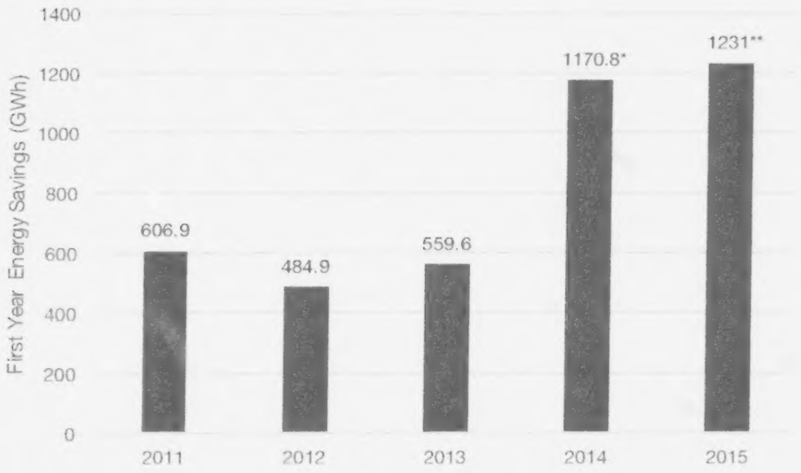


Figure 6.1. First year energy savings from new conservation program activity for distribution-connected customers

*Note: the 2014 incremental first year savings numbers have been updated from the ECO's 2015 *Conservation: Let's Get Serious* report based on IESO true-ups.

**Note: For an equivalent comparison with other years, the 2015 results are the incremental first year energy savings. Of the 1231 GWh saved in 2015, only 1117 GWh will persist into 2020 and therefore will be counted towards the final 7 TWh target.

Performance by Sector

Business programs contributed close to 65% of the year's savings, largely due to the Retrofit program. Some programs such as the Small Business Lighting Initiative and the Home Assistance Program saw a decrease in results but policy and program changes have been made to encourage participation in subsequent years.

One issue that needs to be addressed is the role of combined heat and power. Many utilities are counting on combined heat and power projects to help meet their 2020 conservation targets, but there is **uncertainty about whether combined heat and power increases or reduces greenhouse gas emissions**, and whether it should continue to be supported by conservation funding.

Spending and Cost-Effectiveness in Conservation First Framework

In total, in 2015 the province spent $432 million in the delivery of CDM programs. Only 1.2% of this spending was from the 2015-2020 CFF budget; the rest was funded from the unused budget from the previous framework. This means that LDCs now have almost 6 years' worth of budget left to deliver 5 years' worth of programs, which undoubtedly should help LDCs in achieving their targets.

The cost-effectiveness numbers for the first year of the CFF were positive, with each dollar of spending yielding $1.27 in benefits from a societal perspective, using the Total Resource Cost (TRC) test. The TRC number has improved slightly from last year. This may be in part due to the adder to the TRC calculation to account for non-energy environmental benefits.

Local/Regional Programs

The CFF has triggered a proliferation of **innovation in conservation programming** (unlike the previous framework), with 28 local programs and 31 pilots approved to date. The change in the approvals process and the establishment of clearer rules has made it much easier for LDCs to develop and test program ideas.

IESO-only Programs

The IESO has several programs that it administers directly for large customers. The Industrial Accelerator Program has seen dismal results to date (only 3% of target) and has had several changes made to it to increase participation through to 2020. The IESO is now also responsible for the demand reduction targets for the province. Ontario is aiming to use demand response and peak pricing to reduce peak demand by 10% by 2025, approximately 2,400 MW under forecast conditions. The auction-based mechanism to procure demand response, launched at the end of 2015, has seen an increase in participants from the previous demand response program. The IESO is facilitating the participation of peaksaver PLUS resources in the DR Auction after termination of the program at the end of 2017.

Next Steps in the Framework

Since the CFF was launched, the Minister has amended some of its requirements. In December 2015, LDCs were directed to include all province-wide programs in their CDM delivery, instead of having the flexibility to offer the programs they found appropriate for their customer base. Following another Ministerial Directive, the IESO developed and launched a pay-for-performance multi-utility program in late 2016 and a whole home pilot in 2017. Both programs are being delivered by other parties and not the LDCs; the pay-for-performance program by the IESO and the whole home pilot by gas utilities.

The IESO has completed its Achievable Potential Study which concluded that current funding and programs are sufficient for LDCs to meet the 7 TWH target. The results of this study will feed into the IESO's Mid-Term Review of the CFF, which is required to be completed by June 1, 2018.

Chapter 1

Introduction

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> This report provides Ontario's only comprehensive public summary of energy conservation and efficiency.

1.1 Purpose and Scope of the Report

Every Joule Counts is Volume Two of the Environmental Commissioner of Ontario's (ECO's) 2016/2017 energy conservation progress report.

The first volume, *Every Drop Counts*, was released in spring 2017, and was a focused look at policy opportunities and barriers to reducing the energy and climate footprint of Ontario's municipal water and wastewater systems, the largest energy use for most municipalities.

This second volume is quite different, and presents a broad and primarily quantitative overview of the state of Ontario's energy use, and the role and impact of energy conservation. It addresses the ECO's responsibility under section 58.1 of the *Environmental Bill of Rights, 1993* to report annually on the results of energy conservation initiatives and on progress achieved towards Ontario's energy conservation targets. This report pulls together many different data sources to provide Ontario's only comprehensive public summary of energy conservation and efficiency.

The time frame covered by the report is by necessity a hybrid. Final numerical data on overall energy use and energy conservation results is generally presented as of year-end 2015 (exceptions where more recent data is available are noted in the text). This is because

2015 data is the most reliable set of data across the sector. This is due to the time lag in data collection and reporting, as well as the need for evaluation prior to verifying final results of conservation programs. However, the report's description of policy developments, including policies that affect conservation program activity, is complete through the end of 2016.

1.2 Contents of the Report

- **Chapter 2, Energy Use in Ontario**, presents a statistical look at trends in energy use in Ontario for all major sources of energy, and the impact energy conservation has had on overall energy use. This chapter also looks at trends in energy prices, which affect energy consumption.
- **Chapter 3, Ontario Energy Policy in 2016**, is a fuel-by-fuel summary and timeline of the key laws, regulations, policies, and funding decisions made in 2016 that affect energy use and conservation in Ontario.
- **Chapter 4, Progress on Conservation Targets**, summarizes results achieved towards Ontario's energy conservation targets, such as the long-range electricity conservation target established in the Long-Term Energy Plan.
- **Chapter 5, Natural Gas Conservation Programs**, assesses the 2015 results of conservation programs delivered by Ontario's gas distributors, Enbridge Gas Distribution and Union Gas, and funded by natural gas customers. Policy developments in 2016 that affect gas conservation programs are also discussed in more detail.
- **Chapter 6, Electricity Conservation Programs**, assesses the 2015 results of conservation programs delivered by the Independent Electricity System Operator and Ontario's electricity distributors, and funded by electricity ratepayers. Policy developments in 2016 that affect electricity conservation programs are also discussed in more detail.

1.2.1 Energy Conservation Program Results and the Greenhouse Gas Reduction Account

The energy savings for electricity and natural gas conservation programs presented in this report are based on program evaluations overseen by the Independent Electricity System Operator (for electricity) and the Ontario Energy Board (for natural gas). The ECO tracks the methodology and findings of these evaluations (and also participates as an observer on the Ontario Energy Board's Evaluation Advisory Committee for natural gas conservation results), and raises concerns with these evaluations where appropriate (for example, see Section 6.3.3 of *Conservation: Let's Get Serious*, the ECO's 2015/2016 Annual Energy Conservation Progress Report).

In May 2016, the Ontario government decided to move forward with a cap and trade program that puts the proceeds from emission allowance auctions into a Greenhouse Gas Reduction Account (GGRA). The purpose of this account is to fund initiatives that reduce or support the reduction of greenhouse gas (GHG) emissions (see Chapter 5 of *Facing Climate Change*, the ECO's 2016 Greenhouse Gas Progress Report). Many GGRA-funded initiatives are expected to address energy use, and will likely overlap with existing energy conservation programs.

To confirm that initiatives funded through the GGRA are likely to reduce (or support the reduction of) GHGs, in 2017 the ECO was granted access to confidential ministry information, as well as any evaluation of that information by the Ministry of the Environment and Climate Change. In future reports, the ECO will address the question of how to determine the incremental impact of GGRA-funded initiatives relative to existing energy conservation programs and activities. This will be necessary to assess whether the GGRA spending is being used to reduce GHG emissions.

Chapter 2

Energy Use in Ontario

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Abstract

This chapter provides a macro-level analysis of Ontario's energy use in 2015 in light of key factors. These factors include population and economic changes, as well as conservation programs.

Despite population and economic growth, Ontario's overall energy use did not change significantly between 2014 and 2015; in other words, Ontario continues to improve its energy efficiency. However, further improvements in energy efficiency are not only possible but necessary if the province is to meet its greenhouse gas reduction targets. Significant fuel switching to cleaner, non-carbon based fuels will also be needed.

This chapter also provides a more detailed analysis of fuel-by-fuel use changes in Ontario from 2014 to 2015. Transportation fuel use increased slightly (likely influenced by lower gas prices), while natural gas use decreased slightly (partly due to a warmer winter). Though electricity use has remained almost the same, the supply mix has changed, with more generation from natural gas and renewable energy.

2.1 Overall Energy Use Changes

Ontario's energy mix is made up of three main fuel types: transportation fuels[i] (39%), natural gas (37%), and electricity (20%). The remaining small share of the province's energy use consists of propane (2%), oil (1%) and other fuels[ii] (1%). The majority of Ontario's energy use is fossil-fuelled (see Figure 2.1).

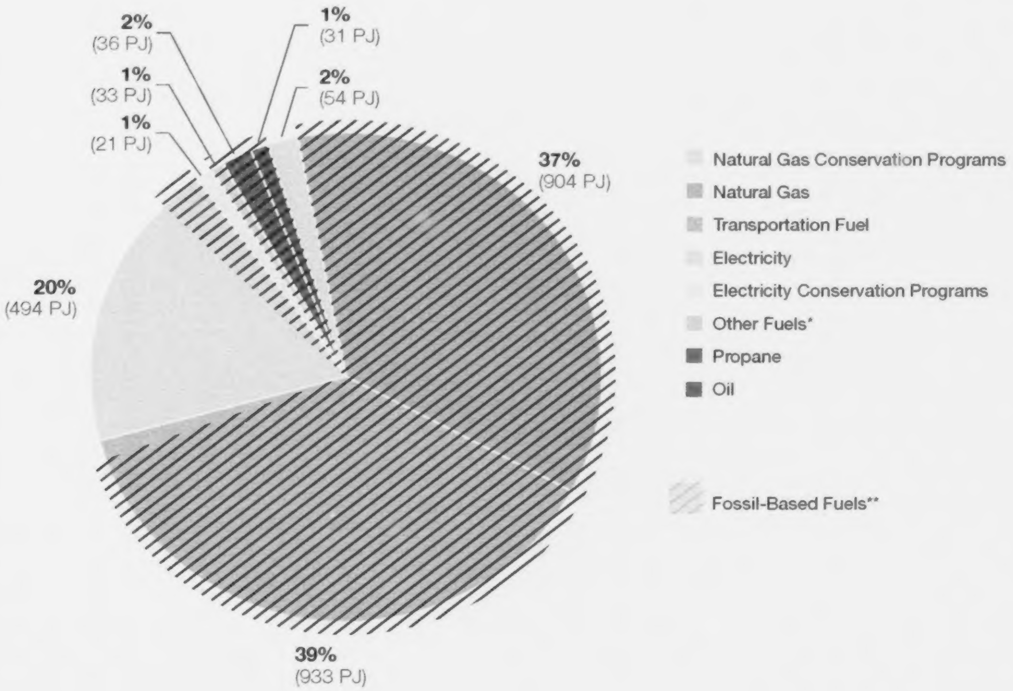

Figure 2.1. Share of overall energy use in Ontario, by fuel type, including demand reduced by utility-run conservation programs - fossil-based fuel sources also highlighted (2015).

Note: 2015 data is preliminary, meaning it is likely to be revised (typically about 1-2%) within a year by Statistics Canada. The percentages total 103 in order to include the 3% demand reduction due to electricity and natural conservation programs. Conservation savings are the sum of annual savings from 2006 through 2015.

***"Other Fuels"** includes coal, crude oil, steam, petroleum coke, coke and coke oven gas. No data is available for coke or coke oven gas use, which can represent up to 120 PJ.

Non **"Fossil-Based Fuels" include about 3.6% of transportation fuels that are bio-based (ECO estimate), and the 90% of electricity produced by nuclear, wind, solar, and biofuels. The percentage of natural gas made from biofuels is not shown as it is negligible.

Source: Statistics Canada, CANSIM table 128-0016; Enbridge and Union Gas' draft 2015 DSM reports, tables 3-9; IESO.

Ontario's energy use has remained relatively consistent from 2007 to 2015 due to energy efficiency improvements.[1] Energy use did not increase despite 8% population growth and 17% economic growth (as measured by real gross domestic product) (see Figure 2.2).[2] Thus, energy use per person has decreased by 7% and per dollar of gross domestic product has decreased by 15%.

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[i] "Transportation fuels" include: motor gasoline, diesel fuel oil, heavy fuel oil, aviation gasoline, and aviation turbo fuel.

[ii] "Other fuels" include: coal, crude oil, petroleum coke, steam, coke and coke oven gas.

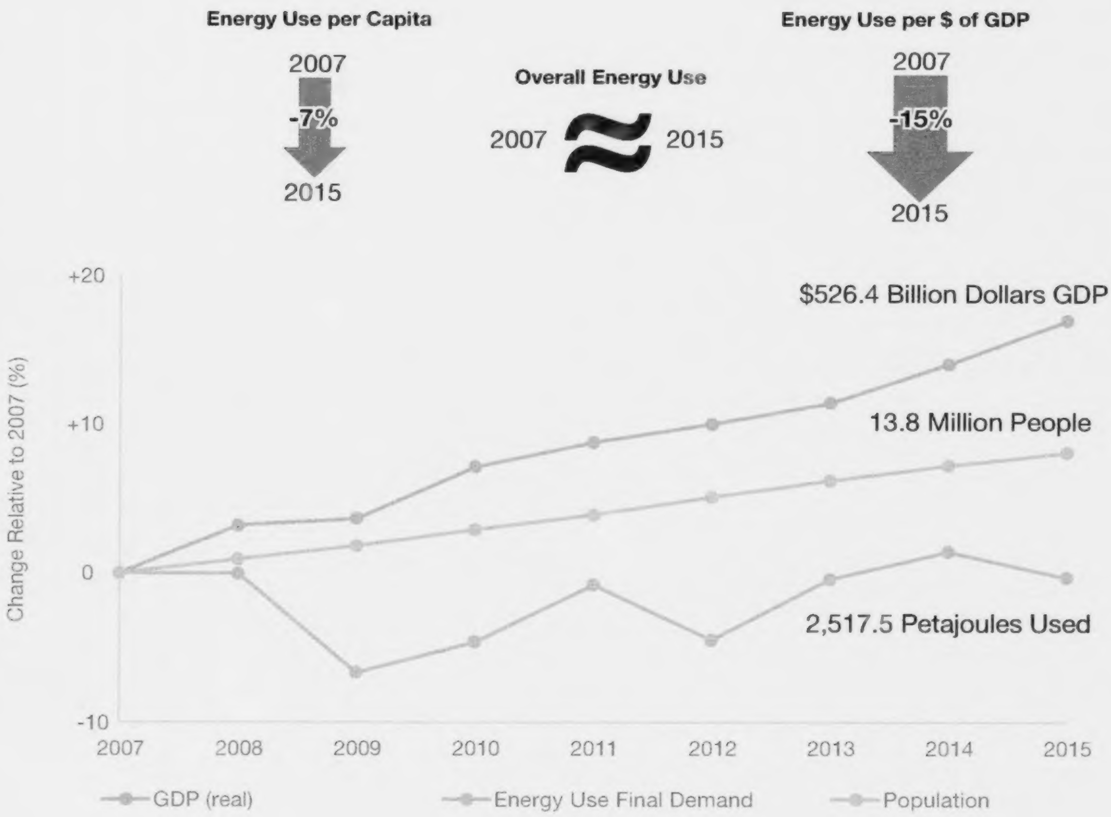

Figure 2.2. Ontario's overall energy use, population and GDP (2007-2015).

Note: 2015 energy use data is preliminary; it is likely to be revised (typically about 1-2%). Historical energy use (pre-2015) is periodically revised by Statistics Canada, so will differ slightly from what the ECO has reported in previous years.

Source: Statistics Canada, CANSIM tables 128-0016, 384-0038, and 051-0001.

The potential for improved energy efficiency in Ontario is substantial. A reduction of over 25% in electricity and natural gas use is economically viable by 2030,[3] and by 2025 new vehicles sold in Canada will be 50% more efficient than they were in 2008.[4] However, given the dominant role of fossil fuels in Ontario's energy mix, efficiency alone will not be enough to meet the province's greenhouse gas reduction targets. Significant fuel switching to cleaner, non-carbon based fuels will also be needed.

The potential for improved energy efficiency in Ontario is substantial.

2.2 Fuel-by-Fuel Use Changes

As discussed above, overall energy use in the province is affected by macro factors, like population and GDP. Individual fuel use changes lend themselves to a slightly more granular analysis, based on changes in five key factors:[5]

- **Building codes and appliance/vehicle standards** are set and occasionally updated by the provincial and federal governments with increasingly stringent energy efficiency requirements. These help drive technological innovation. For example, compared to 1990, clothes washers use about six times less electricity.[6] However, due to challenges in calculating the resulting energy savings for overall electricity and natural gas use, these standards will only be discussed in relation to transportation fuel use.
- **Pricing** can also influence how much and which type of fuel a customer uses, depending on how sensitive a customer's level of consumption is to a change in price. Pricing can be affected by market forces (supply and demand), government policy, taxes, and (in the case of Ontario's natural gas and electricity) the Ontario Energy Board (OEB). Ontario's recently established cap and trade system will also add additional costs to fossil fuel-based energy sources.
- **Weather** extremes can also drive increases in energy use, particularly natural gas use in the winter (Ontario's primary space heating fuel source), and electricity in the summer (Ontario's main air-conditioning source).
- The **makeup of Ontario's economy** can influence the type and amount of fuels used. For example, coke and coke oven gas (categorized under "other fuels") are used almost exclusively in heavy industry, like steel manufacturing.
- **Publicly-funded conservation programs for natural gas and electricity** form a core part of the ECO's reporting mandate, and are assessed in detail in Chapters 5 and 6 respectively. These programs provide a financial incentive for electricity and natural gas distributors to do something for which they would otherwise have no business case: reduce how much fuel their customers purchase from them.

  The ECO estimates that the electric and gas conservation programs offered since 2006 (by the Independent Electricity System Operator and electric and gas utilities) have resulted in overall energy use in 2015 being 3% lower than it would have been in the absence of conservation programs.

Below is a high-level analysis of Ontario's fuel-by-fuel use changes in 2015, taking into consideration the five factors outlined above (where practical).

> Weather extremes can also drive increases in energy use.

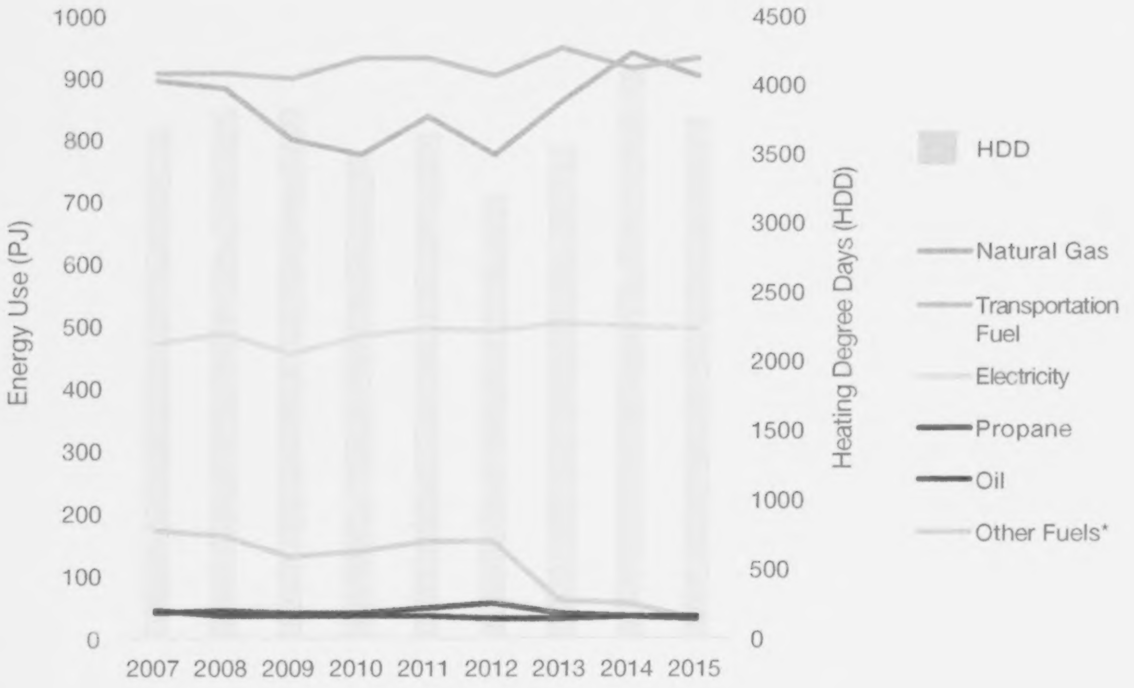

Figure 2.3. Ontario's energy use by fuel type in petajoules, and southern Ontario heating degree days (HDD) (2007-2015).

Note: 2015 data is preliminary, meaning it is likely to be revised (typically about 1-2%) within a year by Statistics Canada.

***"Other Fuels"** includes coal, crude oil, steam, petroleum coke, coke and coke oven gas. For the years 2013-2015, no data is available for coke use in Ontario, and for the year 2015, there is no data available for coke oven gas use.

Source: Statistics Canada, CANSIM table #128-0016; Environment Canada, Monthly Climate Summaries (heating degree days sourced from the Toronto International Airport weather station).

2.2.1 Transportation Fuel

At 39%, transportation fuel made up the largest share of Ontario's energy use in 2015. Its use increased by 2% from 2014 fuel use (from 915 PJ to 933 PJ). This was despite increasingly stringent fuel efficiency standards for new vehicles. In 2015, personal vehicles (including cars and light trucks) driven on Ontario roads were almost 20% more fuel efficient on average than in 1990.[7]

The increase in transportation fuel use may be explained by lower prices and more cars on the road. Gasoline prices were down 16% across Ontario in 2015 from the previous year.[8] Lower gasoline prices may influence transportation fuel use in several ways, for example individuals may choose to drive more and/or purchase less fuel-efficient vehicles. Diesel use is also increasing with freight truck use as Ontario's economy continues to grow and depend more on just-in-time delivery.[9]

Transportation fuel made up the largest share of Ontario's energy use.

2.2.2 Natural Gas

Natural gas use was down by 4% in 2015 (from 941 PJ in 2014 to 904 PJ in 2015). The decrease may have been a result of temperature changes and continued government-funded conservation programs.

Ontario's main energy source for space heating is natural gas. This means warmer winters can reduce natural gas use and vice versa. Heating degree days[10] in 2015 were down by about 8% in Ontario compared to 2014, which had a particularly cold winter.[11]

Conservation programs are offered by Ontario's major natural gas distributors, Enbridge and Union Gas. Since 2006, these programs have resulted in a reduction in overall natural gas demand in 2015 of about 6%. This is an average of less than 1% per year of program-related savings.[12]

The above factors may have been offset to some degree by declining natural gas prices. On average, across the province residential natural gas commodity rates in 2015 decreased by about 23% from 2014 rates (from 18.29¢/m^3 to 14.12¢/m^3). For residential customers, the commodity cost of natural gas was 84% less in 2014 than the cost for an equivalent amount of electricity (the most common alternative fuel source for home heating), and 89% less in 2015 (see Figure 2.4).[13] As we discussed in our special report, *Developing the 2017 Long-Term Energy Plan*, this price differential will need to be addressed if Ontario is to achieve the reduction in natural gas use necessary to achieve its GHG reduction targets.[14]

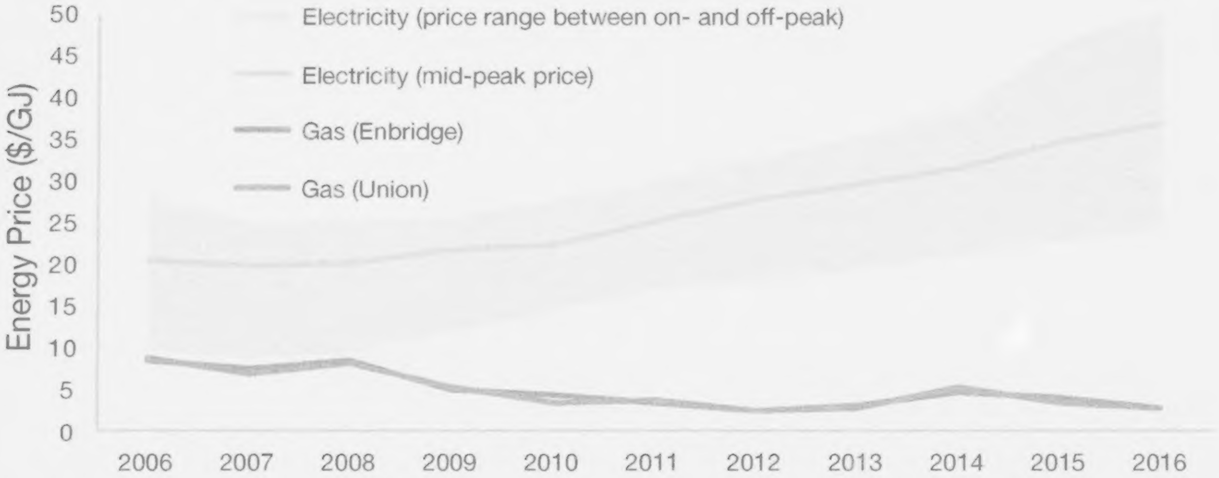

Figure 2.4. Ontario's annual residential time of use electricity prices compared to natural gas prices, per gigajoule (2006-2016).

Note: Does not include cost of delivery to end user.

Source: Ontario Energy Board.[15]

2.2.3 Electricity

Electricity use remained steady in 2015 (from 499 PJ in 2014, to 494 PJ in 2015).[16]

Electricity conservation programs run by local electricity distribution companies (LDCs) and the IESO between 2006 and 2015 resulted in 20.75 PJ of electricity savings in 2015 (4% of electricity use in 2015).[17] For a more detailed discussion of LDC-run electricity conservation programs, see Chapter 6. If we also consider codes and standards, pricing policies, and federal conservation programs, conservation savings totalled an estimated 48.7 PJ or 9.5% of electricity use in 2015.[18] For more details on progress towards province-wide electricity conservation targets, see Chapter 4.

The electricity supply mix (i.e., the type of generation from which electricity was produced) changed substantially year over year. This, despite total energy use remaining relatively stable. In 2015, there was an increase of more than 15% of electricity produced from embedded generation (i.e., distributed energy, connected to local distribution systems instead of the high-voltage transmission grid), from 5.1 TWh in 2014 to 6 TWh in 2015, the biggest increase being solar (see Figures 2.5 and 2.6). Coal finally went down to 0% of electricity production in 2015 (from 84 GWh, 0.1% of production, in 2014), bringing to a completion the province's coal phase-out that began in 2005. And, natural gas use for electricity generation (the most common source used to meet demand peaks) went up about 4%, despite a milder winter in 2015, which would be expected to reduce the use of peaking gas-fired generation.[19] This increase in natural gas may be partially explained by several scheduled nuclear maintenance shutdowns in September, as natural gas is a reliable electricity source available to fill this supply gap (see Figure 2.7).[20]

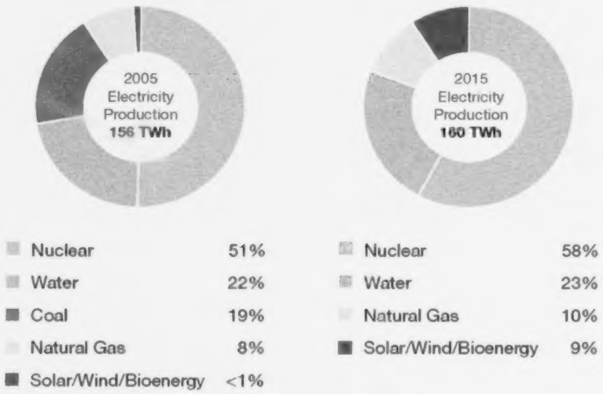

Figure 2.5. Ontario's electricity production by fuel source (2005 vs. 2015)

Note: Includes both electricity produced to meet Ontario demand (143 TWh in 2015, including embedded generation), and net exports (17 TWh in 2015).

Source: Independent Electricity System Operator, *Ontario Planning Outlook 2016*, Figure 2.

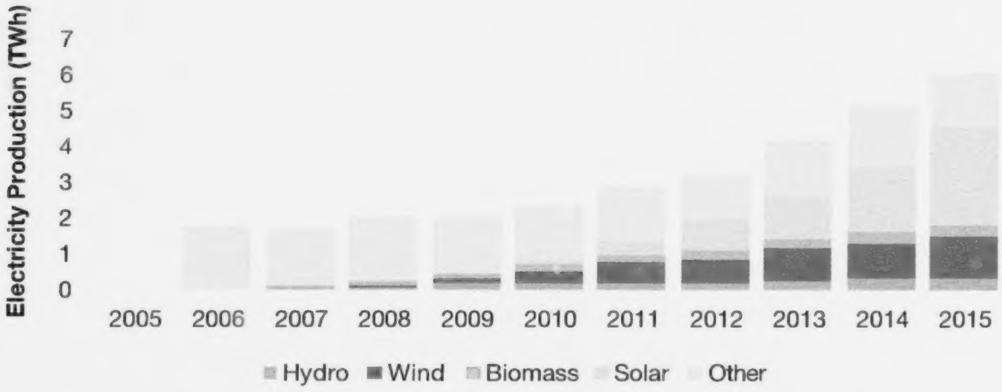

Figure 2.6. Annual distribution-connected (i.e., embedded) energy production in terawatt hours (Ontario, 2005-2015)

Note: "Other" includes resources that are distributed but not under an IESO contract or standard offer program. These are mostly distribution connected hydropower resources and some gas-fired generation (e.g., combined heat and power).

Source: Independent Electricity System Operator.

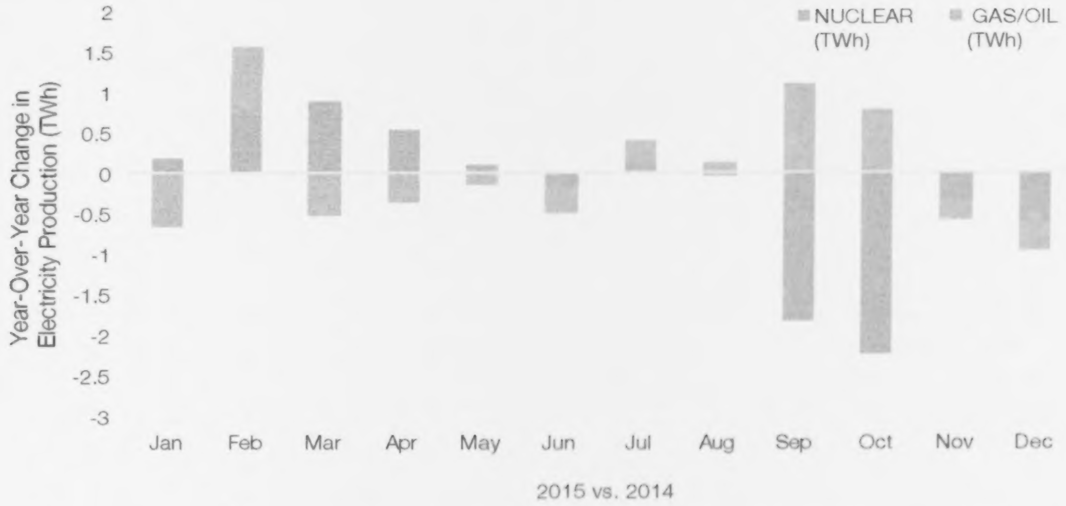

Figure 2.7. Year-over-year change in electricity production from nuclear and natural gas/oil in terawatt hours (Ontario, 2015 vs. 2014).

Source: Independent Electricity System Operator, month-by-month fuel output reports.

2.2.4 Propane, Oil, and Other Fuels

Propane use (typically for home heating in rural areas, or for mobile industry uses) remained steady (from 37 to 36 PJ). Oil use (typically for home heating) dropped slightly (from 35 to 31 PJ). As with natural gas, this reduction may be partially explained by a warmer winter. Ontario's remaining energy sources (i.e., "other fuels"), which include steam, crude oil, coal, petroleum coke, and coke oven gas, are not possible to analyze because Statistics Canada has not disclosed coke use data for 2013-2015 and coke oven gas data for 2015.

2.3 Sector-by-Sector Energy Use Changes

There was no significant shift in how energy use was distributed between Ontario's sectors (see Figure 2.8). The small shift in the industrial sector's fuel use is partially attributable to the missing coke oven gas data for 2015. The preliminary nature of the 2015 energy use data could also be partially responsible.

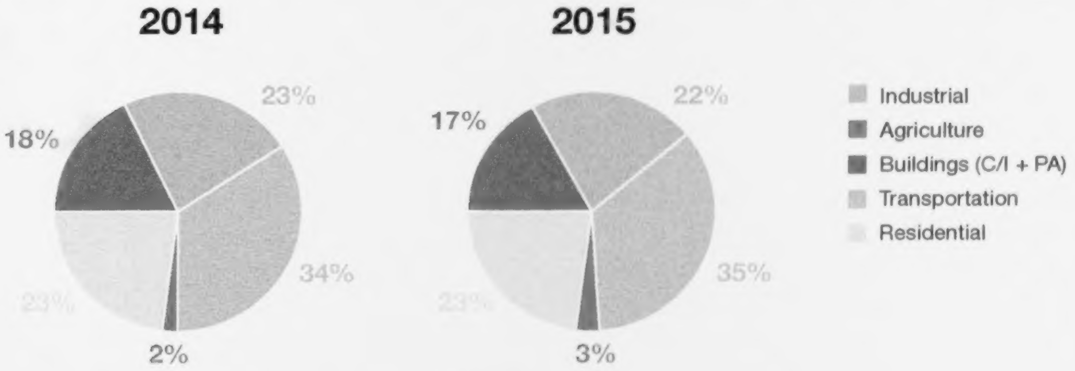

Figure 2.8. Ontario's fuel use by sector (2014 vs. 2015).

Note: 2015 data is preliminary, meaning it is likely to be revised (typically about 1-2%) within a year by Statistics Canada. "C/I + PA" stands for commercial/institutional and public administration.

Source: Statistics Canada, CANSIM table 128-0016.

2.4 Improvements to Electricity Use Reporting for Ontario

Where feasible, the ECO seeks to improve the quality of publicly available fuel use data for Ontario. Over this past year these efforts focused on improving Statistics Canada's electricity use data by initiating communication between Statistics Canada and Ontario's Independent Electricity System Operator (IESO). As a result, Statistics Canada has significantly adjusted its electricity use numbers for Ontario for 2009-2015.

The macro-adjustment made by Statistics Canada to its electricity use data going back to 2009 included:

- accounting for electricity used by local distribution companies (LDCs) on the low voltage grid, and
- using IESO data as a control for Statistics Canada's survey-based electricity generation and imports and exports data.

As Table 2.1 (below) makes clear, the data from both sources is still not exactly aligned.

Table 2.1. Statistics Canada's 2017 Methodological Change: 2014 Case Study

Ontario 2014 Electricity Use Final Demand	
Preliminary (Statistics Canada)	117.888 TWh
Adjusted (Statistics Canada)	138.587 TWh
IESO (including embedded generation, not including off-grid generation)	143 TWh

+17.5%

-3.8%

Source: Statistics Canada and Independent Electricity System Operator.

According to Statistics Canada, IESO data was not adopted wholesale for the following reasons:

1. IESO data does not account for off-grid electricity use;
2. Statistics Canada also benefits from survey-based data;[21] and
3. IESO had not provided its embedded generation data.

Going forward Statistics Canada has indicated that as part of its efforts to improve the quality of its electricity use data for Ontario, it has reduced the threshold of one of its feeder surveys to include more renewable energy companies and will continue its information sharing project with the IESO.

Endnotes

1. From 2,525 PJ in 2007 to 2,517.5 PJ in 2015. However, 2015 data is preliminary. Preliminary Data is typically revised within a year of publication, often by 1-2%. At the time of writing (mid-2017), preliminary 2015 energy use data for Ontario was the most current data available from Statistics Canada, which provides the only comprehensive and consistently reported energy use dataset available for Ontario. (Statistics Canada CANSIM table 128-0016.)

2. Population in 2007 was 12.8 million, in 2015 it was 13.8 million (Statistics Canada, CANSIM table 051-0001); From $450 billion to a $526 billion gross domestic product (expenditure-based, in chained 2007 dollars, as calculated by Statistics Canada, CANSIM table 384-0038).

3. 26.5% by 2030 for natural gas (ICF International, *Natural Gas Conservation Potential Study: Final Report* (2016) at iv); 31% by 2035 for electricity, which includes behind-the-meter generation and an assumption of 11% increase in electricity use (Independent Electricity System Operator, *Achievable Potential Study: Long Term Analysis* (25 November 2016) at 2, 5, and 43); greater efficiencies for both fuels are possible though not currently economical.

4. Government of Canada, News Release, "Harper Government Improves Fuel Efficiency of Canadian Vehicles" (27 November 2012).

5. There is some degree of efficiency that would take place independent of these five factors due to technical innovation.

6. Natural Resources Canada, *Improving Energy Performance in Canada, Report to Parliament Under the* Energy Efficiency Act *2-13-2015* (Ottawa: NRCan, 2016) Figure 2.

7. "Comprehensive Energy Use Database", Transportation Sector, Ontario, Table 9: Road Transportation Secondary Energy Use and GHG Emissions by Energy Source (comparing 1990 to 2014), online: Natural Resources Canada <oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive_tables/list.cfm>.

8. "Fuel Prices", online: Ontario Ministry of Energy <www.energy.gov.on.ca/en/fuel-prices/?fuel=REG&yr=2014>.

Average annual regular unleaded gasoline price ($)	2014	2015	% change 2014 → 2015
Northern Ontario	133.2	111.3	-16
Southern Ontario	126.8	104.7	-17

9. Ministry of Transportation, *Freight Supportive Guidelines* (Toronto: MTO, 2016) at 9-10.

10. Heating degree days is a measure of the annual sum of the degrees of the average daily temperature for all days below 18 °C. The higher the HDD value, the colder the location. ("Climate Zones", online: Natural Resources <www.nrcan.gc.ca/energy/products/categories/fenestration/13954>.)

11. "Monthly Climate Summaries", online: Government of Canada <climate.weather.gc.ca/prods_servs/cdn climate_summary_e.html>.

	Toronto Int'l Airport Weather Station		Timmins A Weather Station	
Year	Heating Degree Days	Cooling Degree Days	Heating Degree Days	Cooling Degree Days
2014	4,103	264	6,502	56
2015	3,766	351	5,975	102
% Change 2014→ 2015	-8	+33	-8	+82

12. Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (Scarborough: EGD, 22 April 2016) Table 3-8; Union Gas, *2015 Demand Side Management Draft Annual Report* (Chatham: UG, 22 April 2016) Table 3-8. (6% is based on adding annual net natural gas savings from 2007-2015, compared to overall natural gas use in 2015).

13. Based on a comparison of energy equivalent commodity prices that excludes delivery to the end user.

14. Environmental Commissioner of Ontario, *Developing the 2017 Long-Term Energy Plan* (Toronto: ECO, December 2016) at 13.

15. "Historical Natural Gas Rates", online: Ontario Energy Board <www.oeb.ca/rates-and-your-bill/natural-gas-rates/historical-natural-gas-rates>; "Historical Electricity Rates", online: Ontario Energy Board <www.oeb.ca/rates-and-your-bill/electricity-rates/historical-electricity-rates>.

16. Although Ontario's Independent Electricity System Operator electricity demand data is different and potentially more accurate (518 PJ in 2014 to 515 PJ in 2015), for consistency purposes across fuels, we enlist Statistics Canada data for our macro-level analysis of Ontario's energy use. Both sources indicate that electricity use reduced slightly from 2014 to 2015 (>1%). (Independent Electricity System Operator, *Ontario Planning Outlook* (Toronto: IESO, September 2016) Figure 4 and Appendix B, Module 2, slides 6 and 7.)

17. Independent Electricity System Operator, information provided to the ECO in response to ECO inquiry (21 March 2017). (5,763 GWh = 20.75 PJ, which represents 4% of IESO's electricity use data for 2015.)

18. *Ibid.* (13,530 GWh = 48.7 PJ, which represents 9% of IESO's electricity use data for 2015.)

19. Independent Electricity System Operator (month-by-month fuel output reports).

20. "Events Reporting: Nuclear Power Plants" online: Canadian Nuclear Safety Commission <nuclearsafety.gc.ca/eng/acts-and-regulations/event-reports-for-major-nuclear-facilities/event-reporting/nuclear-power-plants.cfm>.

21. Statistics Canada uses data it receives from the Annual Supply and Disposition Survey, which takes into account: (1) producer consumption (i.e., electricity consumed by a business for its own use); (2) LDCs on the low voltage grid; (3) transmission losses.

Chapter 3

Ontario Energy Policy in 2016

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Abstract

The energy file in Ontario was very active in 2016, with a tighter linkage between energy and climate policy influencing most of the year's actions. Some of the most important energy developments in Ontario in 2016 were:

1. A law to implement **carbon pricing** through a cap and trade system, and a *Climate Change Action Plan* to further reduce greenhouse gas emissions, in part using revenues from cap and trade.
2. A new legal framework for energy system planning, and the initiation of an updated **long-term energy plan encompassing all fuels**.
3. Actions to move **electric vehicles into the mainstream**, through incentives, public charging infrastructure, and new Building Code requirements.
4. Completion of a co-ordinated land-use planning review, followed by proposed changes to provincial land use plans that focus on **intensification and integration of transit and land use planning**.
5. **Ownership changes of Ontario's energy utilities**, including the continuing government sale of Hydro One, the merger of four large electricity distributors, and the planned merger of the parent companies of Ontario's two large gas utilities.
6. Full implementation of **new conservation frameworks for electricity and natural gas**, with new programs, targets, and budgets.
7. Initial steps to increase production and use of **natural gas from renewable energy sources**.
8. **Refurbishment of Ontario's nuclear fleet**, beginning with the shutdown of a unit at Darlington in October 2016.
9. **Changes to renewable electricity procurement**, including a contract for hydroelectric imports from Quebec, a freeze on new large-scale renewable electricity projects, and a transition of small-scale renewable projects to net metering.
10. Attempts to provide **electricity price relief** to consumers.

3.1 Multiple Fuels, Energy Use in Buildings, and Clean Technology

Climate Change

Climate change dominated the provincial policy agenda in 2016, with the *Climate Change Mitigation and Low-carbon Economy Act* at the centre. For details of this law and the related *Climate Change Action Plan*, see the ECO's 2016 Greenhouse Gas Progress Report, *Facing Climate Change*.

The central feature of the law is that most consumers of fossil fuels have begun paying a carbon price as part of their energy costs as of January 1, 2017. The price is established through a market-based cap and trade system that requires most greenhouse gas emissions to be authorized by allowances. Most of the allowances are sold by auction. Proceeds from the sale of allowances must be placed in a Greenhouse Gas Reduction Account and reinvested into initiatives to reduce greenhouse gas emissions, including actions to reduce energy use or switch to lower-carbon energy sources. The first auction took place in March 2017, and the first proceeds were received in April 2017.

Climate change dominated the provincial policy agenda in 2016.

Although the government did not receive any cap and trade revenue until fiscal year 2017/2018, in 2015 it announced a $325 million "down payment" for some key initiatives through what it called the "Green Investment Fund." In 2016, monies were provided for several initiatives from this temporary fund. The government announced its intention to use monies from the Greenhouse Gas Reduction Account (GGRA) to reimburse this funding. To do so, it will have to meet the requirements for use of GGRA funds set out in the *Climate Change Mitigation and Low-carbon Economy Act* – see Chapter 5 of *Facing Climate Change*. The ECO will be monitoring and reporting on the use of such funds.

Some of the largest initial commitments from the Green Investment Fund were earmarked for energy retrofits in social housing and private apartment buildings, where access to capital for retrofits is often a problem. The Green Investment Fund also committed $100 million to the gas distributors to financially assist homeowners with audits and energy retrofits of their dwellings. Funding is available to homes heated with any fuel – gas, oil, propane, wood or electricity.

Long-Term Energy Plan

The legal framework for energy system planning was changed through the *Energy Statute Law Amendment Act*, which passed in June 2016. This Act repealed the requirement for an Integrated Power System Plan produced by the Independent Electricity System Operator (IESO) and approved by the Ontario Energy Board (OEB). In its place, the Act requires the Ministry of Energy to develop a Long-Term Energy Plan (LTEP). Two technical reports, the *Ontario Planning Outlook* and the *Fuels Technical Report*, were produced to inform the development of the LTEP. These reports examine the current state and future scenarios for the electricity and fuels sectors, respectively. The Ministry of Energy then began consultation (through the discussion guide, *Planning Ontario's Energy Future*) on the LTEP, which will set the provincial direction for the energy sector for the next 20 years. In contrast to previous energy plans, signals are that the Ministry intends to develop a comprehensive plan that covers all energy sources, not just electricity, something the ECO has long recommended.

The ECO provided many specific recommendations on the LTEP in its special report, *Developing the 2017 Long-Term Energy Plan*, including ensuring that the LTEP aligns with Ontario's climate change targets. Public consultation and Indigenous engagement ended in January 2017. At the end of July 2017 the Ministry had not announced a date for finalizing the LTEP.

Energy Use in Buildings

Other initiatives in 2016 addressed multiple fuels by tackling energy use in buildings. Legislation was passed which will require large buildings (50,000 square feet or larger) to report publicly on their energy use, water use, and greenhouse gas emissions, similar to reporting requirements enacted in 2011 for buildings in the broader public sector. The Ministry of Municipal Affairs released technical standards outlining how to comply with the higher energy efficiency requirements in the Ontario Building Code that take effect in 2017, and began consultation on future updates to further improve building energy efficiency, including the consideration of extending energy efficiency requirements to renovations.

> The Ministry intends to develop a comprehensive plan that covers all energy sources, not just electricity.

Table 3.1. 'Multiple Fuels' Initiatives in Ontario in 2016

2016	ACTIVITY
FEBRUARY	Government announces several Green Investment Fund spending commitments: • $100 million to partner with Enbridge and Union Gas to financially assist some 37,000 home audit and energy efficiency retrofits, accessible to homes with any source of heating, including those outside the gas distributors' service areas. • $74 million for a clean-tech innovation initiative to assist large industrial plants to adopt technologies that reduce greenhouse gas emissions. • $25 million to deliver a Green Smart energy efficiency program to improve energy efficiency of small- and medium-sized businesses. • $1.35 million over three years to support Ontario EcoSchools projects to enhance energy literacy and environmental practices among primary and secondary school students. • $1 million to Sustainability CoLab Network for small- and medium-sized businesses to complete energy audits and retrofits and adopt efficiency measures. Ministry of Energy proposes energy and water reporting regulation for large buildings (Environmental Registry #012-6904).
APRIL	Government announces $43 million from Green Investment Fund for energy efficiency retrofits of social housing in Toronto.

MAY

Legislature passes the *Climate Change Mitigation and Low-carbon Economy Act* to establish a cap and trade system for putting a price on many of Ontario's greenhouse gas emissions, create a greenhouse gas reduction account to hold cap and trade revenues, give legal authority to greenhouse gas reduction targets, and other matters. Ministry of the Environment and Climate Change files cap and trade program regulation (O. Reg. 144/16) and greenhouse gas reporting regulation (O. Reg. 143/16).

Government announces $900 million over four years from Green Investment Fund and cap and trade proceeds for energy efficiency retrofits of social housing ($500 million) and private residential apartment buildings ($400 million) across Ontario.

JUNE

Legislature passes the *Energy Statute Law Amendment Act* to revise long-term energy planning, implement building energy efficiency reporting and set water efficiency standards for energy using products.

Government releases *Climate Change Action Plan*, building on the Climate Change Strategy of November 2015, to reduce greenhouse gas emissions and deploy low-carbon energy actions.

Ministry of Municipal Affairs amends supplementary standard for energy efficiency in houses (SB-12), detailing compliance packages for achieving the energy efficiency requirements in the Ontario Building Code that take effect in 2017.

JULY

Ministry of Municipal Affairs proposes amendments to the Ontario Building Code to require drainwater heat recovery in all new houses, and initiates further consultation on how to further increase energy efficiency in new buildings and introduce efficiency requirements for renovations (Environmental Registry #012-8208).

Ministry of Energy begins consultation on the province's next Long-Term Energy Plan (Environmental Registry #012-8840), preceded by technical reports released in September on the fuels sector (*Fuels Technical Report*) and the electricity sector (*Ontario Planning Outlook*). The Ontario Planning Outlook was developed by the IESO in response to a directive from the Ministry of Energy in June.

OCTOBER

Ministry of the Environment and Climate Change proposes an amendment to the cap and trade program regulation (O.Reg. 144/16) to incorporate offsets from greenhouse gas emissions reductions outside the capped sectors (Environmental Registry #012-9078).

NOVEMBER Ministry of Municipal Affairs amends supplementary standard for energy efficiency in large buildings (SB-10), detailing compliance paths for achieving the energy efficiency requirements in the Ontario Building Code that take effect in 2017.

DECEMBER Ministry of Energy amends energy efficiency standards regulation (O. Reg. 404/12) to add or update efficiency standards for 15 products, including the addition of water efficiency standards for five products.

Ministry of the Environment and Climate Change amends cap and trade program regulation (O. Reg. 144/16) and greenhouse gas reporting regulation (O. Reg. 143/16), and posts regulatory proposal (Environmental Registry #012-9270) for Ontario Climate Change Solutions Deployment Corporation (Green Ontario Fund).

> The Action Plan also gave recognition to transportation demand management.

3.2 Transportation Fuels

Transportation in the Climate Change Action Plan

Ontario's *Climate Change Action Plan*, released in June 2016, contained some two dozen specific actions related to transportation energy, although only a handful launched in 2016. Most of the plan's transportation focus centred on displacing conventional motor fuels (e.g., gasoline and diesel) with low-carbon alternatives (e.g., electricity, ethanol and biodiesel). The Action Plan also gave recognition to transportation demand management with several promises: to accelerate Regional Express Rail deployment and encourage commuters to shift to GO train infrastructure; to study short line railways for freight movement; and, to integrate energy measures and policies in land-use planning.

Electric Vehicles

Most of the Action Plan's transportation commitments were not launched in 2016, but progress was made on electric vehicles (EVs). Since 2009, the government has had a goal of 1 in 20 vehicles driven in Ontario being electric by 2020, but progress towards this goal has been very slow, with an estimated 5800 EVs in Ontario at the beginning of 2016. However, progress was made in 2016; at year-end there were nearly 10,000 EVs registered in Ontario. In 2016, the target was changed to 1 in 20 passenger vehicles sold in Ontario (instead of driven) to be electric or hydrogen by 2020.

Funding was announced in February 2016 that maintained and augmented existing EV incentive programs. Plug-in hybrid and battery EVs are both eligible, as they were with the preceding program. Purchase incentives increased by $1,000 to $1,500 depending on the vehicle and its battery size, raising the incentive range to $6,000 - $14,000 (incentives were updated again in early 2017). The $1,000 purchase incentive for home vehicle chargers was maintained. In April, $20 million of new funding was committed from the Green Investment Fund to 27 public- and private-sector partners to build 500 public EV charging stations in 250 locations across Ontario. These fast-charging stations will help address the issue of "range anxiety" and were expected to all be operational by March 2017, although this milestone was not met.

EV policy development continued through the rest of 2016. OEB staff issued an information bulletin clarifying that selling EV charging services would not require a license from the OEB, and the Ministry of Transportation issued a discussion paper seeking public input on future design of electric vehicle purchase and charging financial incentive programs. Of most importance, the Ministry of Municipal Affairs released proposed changes to the Building Code in November that would require all new houses with parking to be built EV-ready (i.e., with an energized 240 volt/50 amp electric receptacle suitable for vehicle charging), an action the ECO had previously recommended, in Chapter 3 of our 2015/2016 Annual Energy Conservation Progress Report, *Conservation: Let's Get Serious*. Other buildings (except for multi-unit apartment buildings) with parking in the building (e.g., attached or underground garages) would need to be equipped with EV charging equipment in 20% of the parking spots, with the other 80% of spots made EV-ready. The primary intent of this proposal is to facilitate workplace charging for EV owners. If implemented, these changes would take effect for new buildings as of January 2018.

Land-Use Planning

Transportation energy use will also be affected by proposed updates to land-use plans announced in 2016 (and finalized in May 2017). Following a co-ordinated review of several plans (the Growth Plan for the Greater Golden Horseshoe, the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan) guiding development in the Greater Golden Horseshoe, the Ministry of Municipal Affairs and the Ministry of Natural Resources and Forestry updated all four plans, based in large part on recommendations received from an advisory group led by former Toronto mayor David Crombie in 2015. Proposed updated plans were released for consultation from May to October 2016, and finalized plans came into effect on July 1, 2017. The amendments are intended, among other things, to limit sprawl and build complete communities, providing adequate density to support transit and reducing energy use for personal transportation. Policies include directing more growth to existing built-up areas, setting density targets around major transit stations, and increasing density targets to at least 80 people and jobs per hectare in designated municipal greenfield areas.

GTA West Highway Review

In another announcement, the government appointed a GTA West advisory panel to assess alternative approaches to meeting future transportation demand and infrastructure needs to ensure the efficient movement of passengers and freight in the GTA West corridor. Previously, in late 2015, work on the environmental assessment of the proposed new GTA West highway had been suspended in order to review the project for alignment with government policy and emerging technologies. It appears that the government is considering alternatives to road-building as the primary solution to transportation management.

Cycling Infrastructure

Funding local governments' active transportation efforts rounded out the Province's low-carbon transportation fuels initiatives in 2016. The $10 million municipal cycling infrastructure program, established as part of Ontario's #CycleON cycling strategy in 2015, was distributed to 37 municipalities and several regions across the province to add new or improve existing bike lanes and paths.

Table 3.2. Transportation Fuels Initiatives in Ontario in 2016

2016	ACTIVITY
FEBRUARY	Ministry of Transportation enhances the Electric Vehicle Incentive Program.
MARCH	Ministry of Transportation releases Request For Proposals for Highway 427 extension, including dedicated High Occupancy Toll lanes with electronic tolling.
MARCH-APRIL	Ministry of Transportation provides $10 million from the Ontario Municipal Cycling Infrastructure Program to build cycling infrastructure.
APRIL	Ministry of Transportation provides $20 million from the Green Investment Fund to build public EV charging stations.
MAY	Ministry of Municipal Affairs continues the Co-ordinated Land Use Planning review and proposes changes to provincial land use plans that govern how and where growth is managed in the Greater Golden Horseshoe region, including a focus on intensification and improved integration of transit, land use planning and climate change (Environmental Registry #012-3256). The review concluded in May 2017 with the release of the updated provincial plans.
JUNE	Ministry of Transportation announces high occupancy toll lane pilot project on Queen Elizabeth Way, enabling single-occupant vehicles to use high occupancy toll lanes. Ministry of Transportation issues discussion paper on revitalizing intercity bus service (Environmental Registry #012-7896) National Energy Board initiates review of TransCanada Energy East pipeline proposal to convert natural gas pipeline to oil.
JULY	OEB releases bulletin stating electric vehicle charging services is not an electricity distribution or retail activity and does not require OEB regulation.
SEPTEMBER	National Energy Board temporarily adjourns hearing on TransCanada Energy East pipeline proposal.

OCTOBER

GTA West advisory panel solicits public input to assess approaches to meet future transportation demand needs in the GTA West.

Ministry of Transportation issues discussion paper (Environmental Registry #012-8727) on program design of EV purchase and charger incentives, and ways to increase education, awareness and uptake of EVs.

Ministry of Transportation and Ministry of Northern Development and Mines issue a discussion paper and continue consultation to develop a Northern Ontario multi-modal transportation strategy (Environmental Registry #012-8890, preceded by Environmental Registry #012-7763).

Ministry of Transportation issues a discussion paper on Cycling Initiatives to improve commuter cycling networks, based on funding proposed in the *Climate Change Action Plan* (Environmental Registry #012-8772)

NOVEMBER

Minister of Energy directs the OEB to review and report back on transportation fuel prices.

Ministry of Municipal Affairs issued proposed Building Code changes requiring houses with parking to be equipped for future electric vehicle charging installation, and large buildings (except for multi-unit apartment buildings) to be equipped with EV charging equipment in a portion of the parking spots (Environmental Registry #012-8208).

Ministry of Transportation launches a planning study to develop a long-term, multi-modal transportation plan for the Greater Golden Horseshoe.

3.3 Natural Gas

Utility Merger

The biggest news affecting Ontario's natural gas sector was not a new government policy, but the planned merger of Spectra Energy and Enbridge Inc., the parent companies of Ontario's two large gas distributors (Enbridge Gas Distribution and Union Gas). The OEB will not review the proposed merger. For now, the distribution utilities continue to run as separate businesses, but it seems inevitable that many business practices will become more similar between the two utilities following the merger.

Cap and Trade Compliance

Union and Enbridge will be among the largest participants in the carbon cap and trade program, as they will be required to hold allowances covering the emissions of all their Ontario customers (excluding certain large customers that are direct participants in the cap and trade program), and emissions from their own facilities (see Chapter 4 of *Facing Climate Change* for more details on the cap and trade program). Union and Enbridge will be required to file compliance plans with the OEB, detailing how they plan to meet their cap and trade obligations. The Board issued a *Regulatory Framework for Assessment of Costs of Natural Gas*

Utilities Cap and Trade Activities (EB-2015-0363) setting out how the OEB will assess these plans for the purpose of approving cost recovery from ratepayers. Union and Enbridge filed one-year compliance plans (for 2017) in November 2016. The 2017 plans rely on purchasing allowances, although plans for future years will likely also include abatement activities (e.g., building retrofits, delivering renewable natural gas, reducing leaks of fugitive emissions). In December 2016, the Board set natural gas rates to include the anticipated costs of cap and trade compliance (approximately 3.3 cents per cubic metre of natural gas), with the new rates taking effect in January 2017.

Union and Enbridge will be among the largest participants in the carbon cap and trade program.

Renewable Natural Gas

Another climate-related policy development affecting the natural gas sector was interest in renewable natural gas (RNG), e.g., methane from landfills, agricultural residues, or sewage treatment plants. In 2011, Enbridge and Union had applied to the Board for the ability to add an amount of RNG (at a higher price) to the gas supply they provide to customers. The Board did not approve the application, but invited Enbridge and Union to submit a revised proposal (the utilities declined to do so, believing it was unlikely to be approved). However, times have changed. The *Climate Change Action Plan* committed to introducing a renewable content requirement for natural gas, and the government has announced $100 million in funding from the GGRA to help implement this. Late in 2016, the Minister of Energy wrote to the OEB to confirm the government's interest in the OEB examining how to incorporate RNG into Ontario's natural gas supply. In 2017, the OEB began the process of establishing a framework for assessing distributor gas supply plans that would include RNG.

Natural Gas Conservation

In January 2016, the OEB approved the new demand-side management plans of Enbridge and Union Gas covering the period 2015-2020 (2015 was treated as a transition year due to the delay in submitting and approving these plans; conservation results from 2015 programs are reviewed in Chapter 5 of this report). The new plans include higher conservation budgets and targets than under the 2012-2015 period, and new conservation programs. Mid-year, the OEB released a *Natural Gas Conservation Potential Study*, to assess how much natural gas use in Ontario can be reduced through conservation programs. The study estimates that consumption could be reduced by about 25% if all cost-effective actions are implemented, but that realistically, the potential is lower, and is dependent on customer uptake and utility budget. This study may be used as part of a mid-term review of the natural gas conservation framework to examine whether the savings targets for gas utilities are appropriate.

Consumption could be reduced by about 25% if all cost-effective actions are implemented.

Natural Gas System Expansion

Finally, the OEB (case EB-2016-0004) ruled out allowing the expansion of natural gas distribution systems to currently unserved communities to be subsidized through rate increases for existing customers. The Board broke from "postage stamp" ratemaking, by granting distributors flexibility to charge higher rates to customers in newly connected communities to recover expansion costs. This leaves distributors to decide whether such expansions will prove profitable and should be pursued. In response, in early 2017, the Ministry of Infrastructure announced a $100 million grant program that would pay for some of these infrastructure costs.

Table 3.3. Key Natural Gas Initiatives in Ontario in 2016

2016	ACTIVITY
JANUARY	OEB issues decision on Enbridge and Union Gas's 2015-2020 conservation (or demand-side management) plans setting annual budgets, program savings targets, shareholder incentives and target metrics.
MARCH	OEB approves quarterly changes to the prices gas distributors will charge customers, effective April 1, 2016.
MAY	Government commits up to $100 million over four years from the Greenhouse Gas Reduction Account to support the use of renewable natural gas in industry, transportation and buildings.
JUNE	OEB approves quarterly changes to the prices gas distributors will charge customers, effective July 1, 2016.
JULY	OEB releases *Natural Gas Conservation Potential Study* to inform natural gas conservation planning and programs.
	OEB issues determination on billing and customer outreach issues for the cap and trade framework for gas distributors, including allocation of how cap and trade costs will be recovered from natural gas customers, and determination that cap and trade charges will not appear as a separate charge on utility bill.
AUGUST	OEB issues new edition of *Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and Facilities*.
SEPTEMBER	OEB approves quarterly changes to the prices gas distributors will charge customers, effective October 1, 2016.
	OEB issues *Regulatory Framework for the Assessment of Costs of Natural Gas Utilities' Cap and Trade Activities*.
NOVEMBER	OEB issues decision (EB-2016-0004) regarding utility cost recovery for expansion of natural gas systems to unserved communities.

OEB issues decision (EB-2016-0004) regarding utility cost recovery for expansion of natural gas systems to unserved communities.

Gas utilities file proposed cap and trade compliance plans with OEB (EB-2016-0296, EB-0216-0300, EB-2016-0330).

DECEMBER

OEB announces it does not plan to review the proposed merger of Enbridge (the parent of gas utility Enbridge Gas Distribution) and Spectra Energy (the parent of gas utility Union Gas).

Ministry of Energy issues letter encouraging the OEB to examine renewable natural gas as a part of gas utility supply portfolios.

OEB approves quarterly charges to the prices gas distributors will charge customers, effective January 1, 2017, including cap and trade compliance costs.

3.4 Electricity

Electricity Pricing

Pressure to keep electricity rates as low as possible reasserted itself in 2016 (disproportionately to the actual impact of electricity rates). The year began with the removal of the Debt Retirement Charge from residential bills (non-residential consumers will continue to pay the charge until March 31, 2018). Also in January 2016, the Ontario Electricity Support Program was launched to provide additional financial assistance on electricity bills to low-income consumers.

Two more initiatives to provide price breaks to different segments of consumers were launched in October. The *Ontario Rebate for Electricity Consumers Act, 2016* rebates the 8% provincial portion of the Harmonized Sales Tax from the electricity bills of households, farms, and small businesses. Simultaneously, the government increased the amount of subsidy provided to customers in rural and remote areas, who pay higher rates for delivery of their electricity due to lower density. {In 2017, the Ministry of Energy took further action to reduce residential electricity bills through the Fair Hydro plan. In line with the ECO's recommendation in Chapter 6 of *Facing Climate Change*, the Ministry chose not to follow through with its original plan to use funding from the Greenhouse Gas Reduction Account to reduce electricity rates.}

> Pressure to keep electricity rates as low as possible reasserted itself in 2016.

None of the measures described above reduces the true cost of supplying Ontario's electricity; instead they transfer costs from electricity ratepayers to taxpayers, or from one group of ratepayers to another. In contrast, two actions in 2016 attempted to adjust pricing signals to reduce peak demand; in the short term, these initiatives also transfer costs between ratepayer groups, but they hold potential over the longer term to deliver savings to all electricity customers. First, in June the OEB issued the *Regulated Price Plan Roadmap: Guideline for Pilot Projects on RPP Pricing*, a call for pilot projects to assess alternatives to the current time-of-use pricing structure. These pilots will test pricing or technological solutions to enable more customers to shift the timing of their electricity use away from peak hours. Second, the Ministry of Energy expanded the Industrial Conservation Initiative program for large industries by lowering the threshold for eligibility to one megawatt (MW) average monthly demand and adding several industrial customer types. This program enables participants to reduce their electricity bills if they conserve power during times of system-wide peak demand.

Renewable Electricity

It was a very busy year for renewable electricity procurement and policy. In March, the IESO concluded the Large Renewable Procurement I (LRP I), a return to the competitive procurement model for large renewable projects. Contracts were awarded to 16 new wind, solar, and hydro projects totalling 455 MW, at lower prices (averaging 8.6 cents/kilowatt-hour for wind and 15.7 cents/kilowatt-hour for solar) than the previous feed-in tariff (FIT) model with fixed pricing. The Minister of Energy then issued an April directive to the IESO to commence a second phase (LRP II) to procure almost 1,000 MW of additional renewable energy projects. However, in September, the Minister abruptly reversed course and suspended this procurement through a second directive, due to Ontario's strong supply position, and to save costs for ratepayers. It is unclear whether this decision means that the Ministry's overall renewable electricity targets (10,700 MW of non-hydro renewables by 2021, 9,300 MW of hydro by 2025) will also be revised.

While the Ministry was having second thoughts about new Ontario renewable energy projects, it opened the door to greater utilization of Quebec's hydroelectric resources. An agreement signed in December between Hydro-Québec and the IESO will allow Ontario to purchase two terawatt-hours of electricity annually for the next seven years from Quebec, using existing interconnections between the two provinces. Ontario indicated that this firm source of power will reduce the use of gas-fired generation (and the associated greenhouse gas emissions), during the period of nuclear refurbishment.

For smaller renewable energy projects (primarily solar), the Ministry of Energy continued to wind down the FIT and microFIT programs, with directions confirming that 2016 and 2017 would be the last year applications would be accepted for the FIT and microFIT programs, respectively. The programs will be replaced with net metering, whereby customers are credited on their electricity bill for the amount of renewable energy produced, and pay only for the net amount of energy consumed. The Ministry of Energy consulted on proposed regulatory changes to enable net metering in 2016 (Environmental Registry #012-8435), and finalized a regulation in early 2017.

> Refurbishments at Darlington and Bruce are to be staged over a period of almost 20 years.

Nuclear Refurbishment

In January 2016, the Ministry of Energy announced that it had approved Ontario Power Generation (OPG)'s plans both to extend the life of the Pickering station to 2024 and to refurbish the four nuclear reactors at Darlington. The Pickering plant had been scheduled to close in 2020 and will require approval for continued operation from the Canadian Nuclear Safety Commission. The refurbishments at Darlington are in addition to planned refurbishments of six units by Bruce Power, which reached a contractual agreement with the IESO at the end of 2015. Refurbishments at Darlington and Bruce are to be staged over a period of almost 20 years, and the first of these units to be refurbished went off-line at Darlington in October 2016. Unlike Bruce Power, the price paid for electricity production from OPG's nuclear assets must be reviewed and approved by the OEB. In May, OPG filed a five-year application with the OEB (EB-2016-0152) that includes the costs of the first Darlington unit refurbishment and the Pickering extension. The application (as amended) requests an increase of 2.5% in the unit price paid for OPG's nuclear and hydroelectric production for each of the five years (primarily due to the Darlington refurbishment), and would increase residential electricity bills by about $3.25 per month by the end of the five-year period, if approved as filed. The application is still under review by the OEB.

Ownership of Electric Utilities

The Ontario government continued to reduce its ownership role in Ontario's electricity sector. In May, the government completed a second round of sales of shares in Hydro One, raising $2 billion. The province has now reduced its ownership stake in Hydro One from 100% to 70%, with plans to eventually hold only a 40% ownership interest. In addition, distribution utilities PowerStream, Horizon, and Enersource merged into one, and the new entity purchased Hydro One Brampton (a separate company from Hydro One) from the province for $607 million. The OEB approved this merger in December 2016. The new consolidated distributor (now known as Alectra Utilities) will be the second-largest in Ontario with nearly one million customers in York Region, Simcoe County, Peel Region, Hamilton and St. Catharines, trailing only Hydro One in size.

Electricity Conservation Programs

All Ontario electric utilities migrated fully to the new Conservation First framework of conservation program delivery in 2016, following a transition year in 2015 (2015 electricity conservation program results are reviewed in Chapter 6 of this report). The Minister of Energy directed the IESO to initiate two new electricity conservation programs – a "whole home" retrofit pilot for residential customers integrating gas and electricity conservation, and a pay-for-performance conservation program for businesses with multiple locations across Ontario. The IESO completed an *Achievable Potential Study* (in parallel to the study for the natural gas sector) to assess how much electricity use in Ontario can be reduced through conservation programs. The study concluded that the existing conservation target for electric distributors (seven terawatt-hours in 2020) is realistic, given the timeframe and budget. In December, the IESO held its second annual demand response auction, in which electricity consumers commit to reducing electricity use when needed (as an alternative to procuring new supply resources), in return for a payment from the IESO. Prices from the auction were 12-17% lower than the first auction in 2015.

Table 3.4. Electricity Initiatives in Ontario in 2016

2016	ACTIVITY
JANUARY	Debt Retirement Charge removed from residential electricity bills
	Ontario Government approves OPG's plan to refurbish the four units at Darlington nuclear generating station and continue operation of Pickering nuclear generating station until 2024.
	Ontario Electricity Support Program takes effect to provide low-income electricity consumers with a credit to lower their bills.
FEBRUARY	OEB issues updated Regulated Price Plan Manual reflecting objectives in 2015-issued *Regulated Price Plan Roadmap*.
MARCH	Government approves the sale and municipal councils of Barrie, Markham, Vaughan, Mississauga, Hamilton and St. Catharines approve the merger of Hydro One Brampton with a new company comprised of Powerstream, Enersource and Horizon.
	OEB releases discussion paper on rate design options for commercial and industrial electricity customers.
	IESO issues *Energy Storage* report summarizing lessons learned from storage procurement and options for integration of storage into the electricity market.

IESO concludes first phase of competitive large renewable energy procurement (LRP I), offering contracts to 16 wind, solar, and hydro projects totalling 455 MW of capacity.

APRIL

Ministry of the Environment and Climate Change amends the environmental approvals regulation (O. Reg. 359/09) for renewable energy projects.

Minister directs the IESO to procure renewable energy resources through a second phase of the large renewable energy procurement (LRP II).

OEB releases report defining typical electricity customer and adopts 750 kilowatt-hours per month as the typical consumption metric.

MAY

OPG initiates rate filing with OEB (EB-2016-0152) for prescribed generation assets from 2017-2021, including cost recovery for nuclear refurbishment.

Ministry of Northern Development and Mines initiates consultation on future design of the Northern Industrial Electricity Rate Program (Environmental Registry #012-7448)

Updated Regulated Price Plan (summer) electricity commodity prices take effect.

Government completes second share offering of Hydro One, raising $2 billion.

JUNE

IESO releases *Achievable Potential Study* for electricity conservation.

Minister directs IESO to design a pay-for-performance conservation program for consumers located in several regions of the province and are served by multiple distributors, and a whole home pilot program for residential consumers.

IESO offers FIT 4 contracts (936 contracts, 241 MW) to developers, cooperatives, municipalities or public sector entities, and indigenous communities.

GTA East Regional Planning, IESO issues Integrated Regional Resource Plan (IRRP) for Pickering-Ajax-Whitby sub-region.

Northwest Regional Planning, IESO issues IRRP for Greenstone-Marathon sub-region

Burlington to Nanticoke regional planning, IESO issues IRRP for Bronte sub-region

JULY

Government selects Wataynikaneyap Power to connect 16 remote First Nation communities in northwestern Ontario, currently relying on diesel power, to the province's electricity grid, with work to start in 2018.

Northwest Regional Planning, IESO issues IRRP for West of Thunder Bay sub-region.

OEB issues guideline and technical manual for distributors to implement time-of-use pricing pilot projects.

OEB issues 2015 system-wide supply mix data under O. Reg. 416/99, disclosure by electricity retailers.

AUGUST

Ministry of Energy proposes amendments to net metering regulation (O. Reg. 541/05), with the intent of transitioning small renewable electricity project development (particularly solar) from a feed-in tariff to net metering (Environmental Registry #012-8435).

SEPTEMBER

Minister directs the IESO to suspend the second round of the Large Renewable Procurement process (LRP II) and the Energy-from-Waste Standard Offer Program, halting procurement of 1,000 MW of renewable energy projects.

OCTOBER

Legislature passes the *Ontario Rebate for Electricity Consumers Act, 2016* (and subsequently files supporting regulations in November), to reduce electricity bills by providing an 8% credit to residential customers, small businesses and farms.

OEB announces that updated Regulated Price Plan (winter) electricity commodity prices will remain unchanged.

OPG shuts down and begins refurbishment of first unit (Unit 2) at Darlington nuclear station.

Government signs an agreement-in-principle with Quebec to annually import up to two terawatt-hours of power from 2017-2023, and Minister of Energy directs IESO to enter into an electricity trade agreement with Quebec.

OEB approves Hydro One's purchase of Great Lakes Power Transmission which will operate as a stand-alone transmitter under the name Hydro One Sault Ste. Marie starting in 2017.

NOVEMBER

Ministry of Energy expands eligibility for the province's Industrial Conservation Initiative (critical peak pricing) to smaller customers and additional sectors, through an amendment to O. Reg. 429/04.

Ministry of Energy increases financial assistance to rural and remote electricity customers to $243 million annually, through an amendment to O. Reg. 442/01.

DECEMBER

OEB approves merger of Hydro One Brampton, Powerstream, Enersource and Horizon (EB-2016-0025,EB-2016-0360).

Minister directs IESO to make several changes to the Conservation First Framework.

IESO and Hydro-Québec conclude electricity trade agreement.

IESO issues IRRPs for the two sub-regions in the South Georgian Bay/Muskoka Planning Region – Parry Sound/Muskoka and Barrie/Innisfil, and for the Thunder Bay sub-region in the Northwest Planning Region.

Ministry of Energy amends regulation (O. Reg. 95/05) under the Ontario Energy Board Act, 1998, to allow the Ontario Energy Board flexibility in setting time-of-use periods for electricity rates in pilot projects.

IESO concludes second Demand Response auction, securing approximately 450 MW of demand response capacity for 2017.

OEB issues 2015 conservation program results for electricity distributors.

Chapter 4

Progress on Conservation Targets

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Abstract

This chapter describes the province's progress in meeting any targets it has established for reducing the use or making more efficient use of electricity, natural gas, propane, oil and transportation fuels. The ECO considers "government-established targets" to result from either a formal government policy or a Minister directing activities that specify an amount of energy to be conserved.[1]

The tables in this section provide an overview of progress towards government-established energy targets for the 2015-2016 reporting year.

Progress on all targets is reported as of December 31, 2015, unless otherwise indicated.

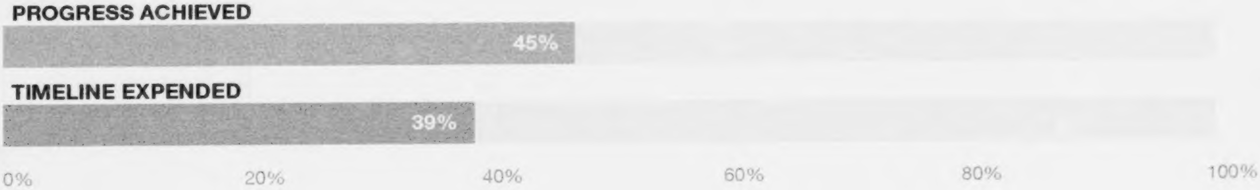
Note: Several targets reviewed last year are not included in this year's review because:

- The target period is completed (i.e., old electricity utility targets, energy storage)
- The target was superseded (i.e., the low carbon fuel standard, 1 in 20 vehicles driven to be EVs)
- The target was abandoned (i.e., the Premier's agreement at the 2008 Council of the Federation)
- It is not a target (i.e., the Ministry of Education's energy use database)

4.1 Electricity Conservation Targets

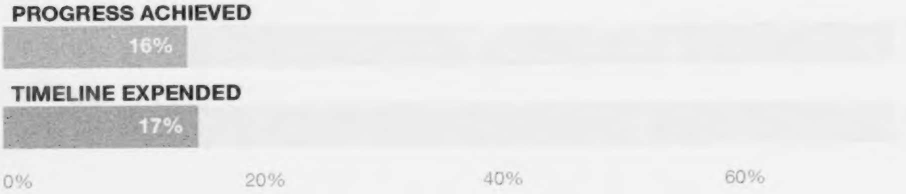
4.1.1 Long-Term Energy Plan Target

Target	**30 TWh reduction of electricity demand in 2032, due to conservation efforts from 2005 onwards**
Source	Long-Term Energy Plan 2013
Responsibility to Address	Ministry of Energy / Independent Electricity System Operator
Update[2]	13,530 TWh of electricity savings in 2015, not all of which will persist until 2032 (from: utility run conservation programs, codes and standards, pricing policies, and other programs not delivered by LDCs and the IESO)



4.1.2 Electricity Conservation Programs (Utility-Run)

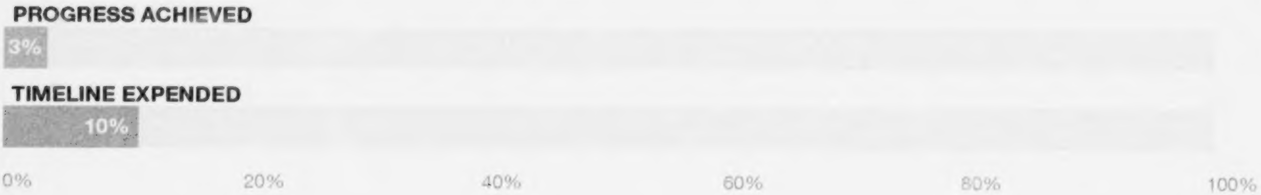
Target	**7 TWh reduction of electricity demand in 2020, due to conservation activities by distribution utilities between 2015-2020**
Source	2015-2020 Conservation First Framework (Ministry of Energy Direction to the Independent Electricity System Operator (IESO))[3]
Responsibility to Address	Local Distribution Companies, with oversight by IESO
Update	In 2015, conservation savings that will persist until 2020 were 1.1 TWh[4]
Relationship with other Conservation Targets	Achievements contribute to the province's conservation target of 30 TWh by 2032, as set out in the 2013 Long-Term Energy Plan



See Chapter 6 to learn how LDCs are progressing toward this target.

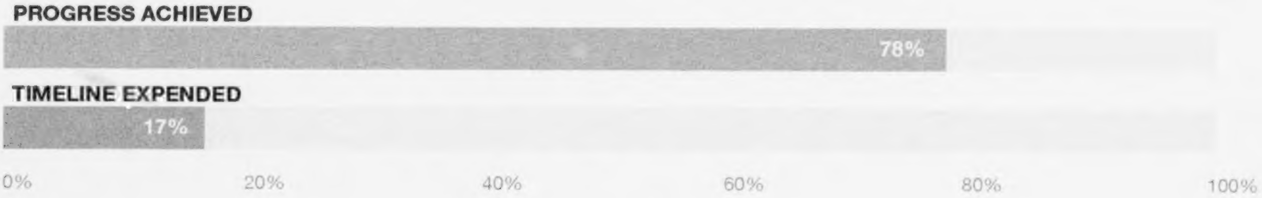
4.1.3 Transmission-Connected Customer Savings

Target	**1.7 TWh reduction in annual electricity demand from transmission-connected customers, from projects approved by the end of 2020**
Source	Ministry of Energy direction to the Independent Electricity System Operator
Responsibility to Address	Independent Electricity System Operator
Update	The latest verified results, as of the end of 2015, indicate the Industrial Accelerator Program has achieved 49 GWh (3%) of the 1.7 TWh target 2015 results are expected to increase slightly due to adjustments[5]



4.1.4 Electricity Demand Response Savings

Target	**Demand Response to meet 10% of peak demand in 2025 (2,400 MW under current forecasts)**
Source	2013 Long-Term Energy Plan
Responsibility to Address	Ministry of Energy / Independent Electricity System Operator
Details	Progress towards this target results from the following programs:[6] • Time-of-use (TOU) pricing strategies • The Industrial Conservation Initiative (ICI) • The Capacity-Based Demand Response (CBDR) program[7] • Dispatchable Load • The Demand Response Pilot program[8] • Peaksaver residential Demand Response program[9] • Demand Response Auction[10]
Update	1,840.8 MW peak demand reduction in 2015 due to: • ICI 1,075 MW • TOU 58.7 MW • CBDR 526.2 MW[11] • Peaksaver 180.9 MW



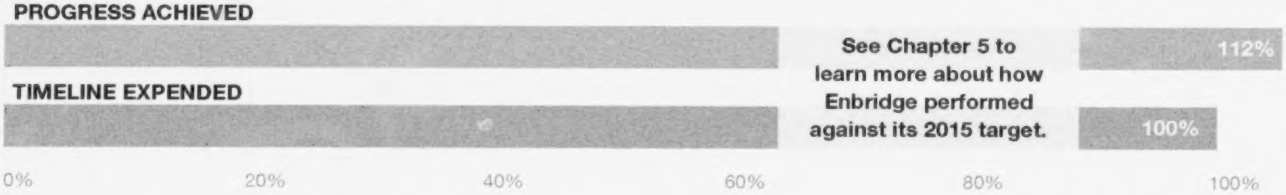
4.2 Natural Gas Conservation Targets

Ontario's two large natural gas utilities (Enbridge Gas Distribution and Union Gas) have annual performance targets for their conservation activities. These targets and their reported results must be approved by the Ontario Energy Board (OEB). Depending on their verified results, the gas utilities receive varying amounts of financial incentives.

While these targets are not "government-established targets," the ECO also reports on them to provide a more complete understanding of the state of energy conservation in Ontario.

4.2.1 Enbridge Conservation Target

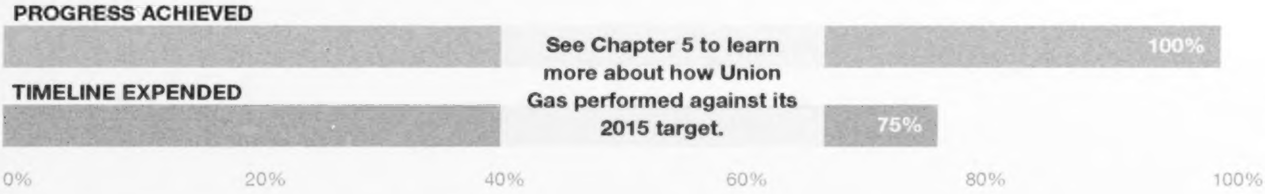
Target	**0.77 billion m^3 cumulative natural gas savings from 2015 programs**
Source	Enbridge's *2015-2020 Demand Side Management Plan*[12] in response to OEB's *2015-2020 Natural Gas DSM Framework*[13]
Responsibility to Address	Enbridge Gas Distribution
Update	2015 Cumulative Savings: 0.866 billion m^3[14] Proposed 2020 conservation target: 6.36 billion m^3 cumulative natural gas savings due to conservation activities between 2015-2020[15] OEB's decision in response to the proposed savings targets for 2016-2020 calls for a 10% increase to Enbridge's proposed 2016 target, followed by an adjustment mechanism for each subsequent year based on verified savings[16]



See Chapter 5 to learn more about how Enbridge performed against its 2015 target.

4.2.2 Union Gas Conservation Target

Target	**2.1 billion m^3 of cumulative natural gas savings from 2015 programs**
Source	Union Gas, *2015 Demand Side Management Draft Annual Report*[17]
Responsibility to Address	Union Gas
Update	2015 Cumulative Savings: 1.57 billion m^3[18] Proposed 2020 conservation target: 6.16 billion m^3 cumulative natural gas savings due to conservation activities between 2016-2020 (Union Gas' *2015-2020 Demand Side Management Plan*[19], in response to OEB's *2015-2020 Natural Gas DSM Framework*[20]) OEB's decision in response to the proposed savings targets for 2016-2020 calls for a 10% increase to Union's proposed 2016 target, followed by an adjustment mechanism for each subsequent year based on verified savings[21]



See Chapter 5 to learn more about how Union Gas performed against its 2015 target.

4.3 Transportation Fuel Conservation Targets

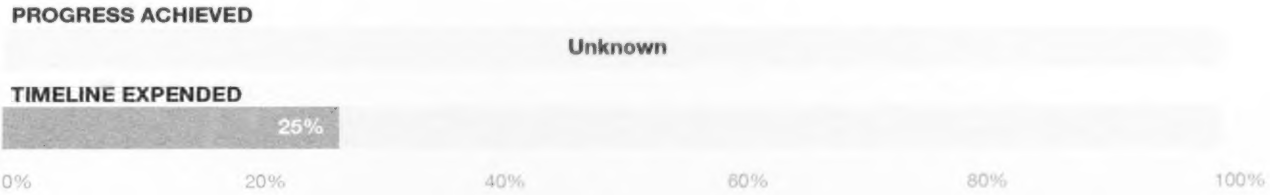
The transportation fuel targets reported here involve fuel switching away from petroleum fuels (gasoline and diesel). As this fuel switching reduces the use of petroleum fuels and may also improve energy efficiency (particularly for electric vehicles), these targets are considered to fall within the ECO's reporting mandate.

4.3.1 Renewable Fuel Standard for Gasoline

Target	**Reduce greenhouse gas emissions from gasoline by 5% by 2020 via Renewable Fuels Standard for gasoline**
Source	Climate Change Action Plan, 2016
Responsibility to Address	Ministry of the Environment and Climate Change (MOECC)
Update (as of July 2017)	A Renewable Fuels Standard for gasoline was proposed on the Environmental Registry (# 012-7923) on January 11, 2017. As of the time of writing, no decision has been posted. This target appears to supersede Ontario's pre-existing commitment to establish a low carbon fuel standard; a target that was never acted upon.

4.3.2 Increase Number of Electric and Hydrogen Vehicles

Target	**5% of passenger vehicle sales to be electric or hydrogen in 2020** *(Supersedes previous target: 1 in 20 vehicles driven in Ontario to be electric (EV) by 2020)*
Source	Climate Change Action Plan, 2016
Responsibility to Address	Ministries responsible for initiatives that will help the government achieve its target: **Transportation:** EV incentives and charging infrastructure **Energy:** EV overnight charging **Environment and Climate Change:** vehicle replacement **Finance:** working with federal government to eliminate HST on battery-EVs **Infrastructure:** EV charging at government facilities **Municipal Affairs:** Building Code amendments
Update	The Ministry of Transportation does not have data on vehicle sales in Ontario, and as a result is unable to report on progress towards this target.



4.4 Propane, Oil, and Other Fuels Conservation Targets

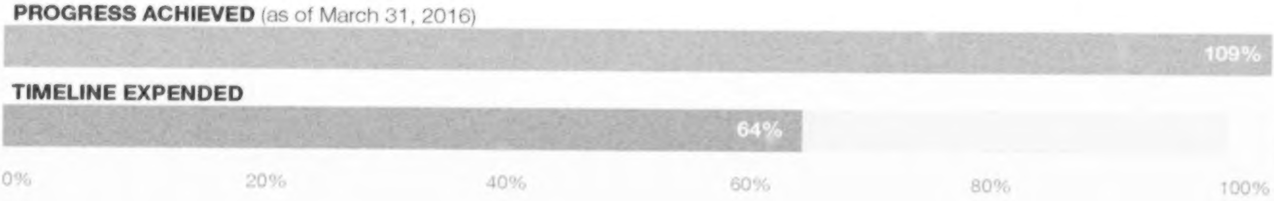
The Ministry of Energy's 2017 Long-Term Energy Plan discussion guide, *Planning Ontario's Energy Future*, poses the question "should Ontario set conservation targets for other fuel types, such as oil and propane."[22]

The ECO has urged the government to do just that in two recent reports: *Developing the 2017 Long-Term Energy Plan* (December 2016), and *Conservation: Let's Get Serious* (May 2016).[23] No decision has yet been made by the Ministry.

4.5 Ontario Public Service Energy Use Reduction Targets

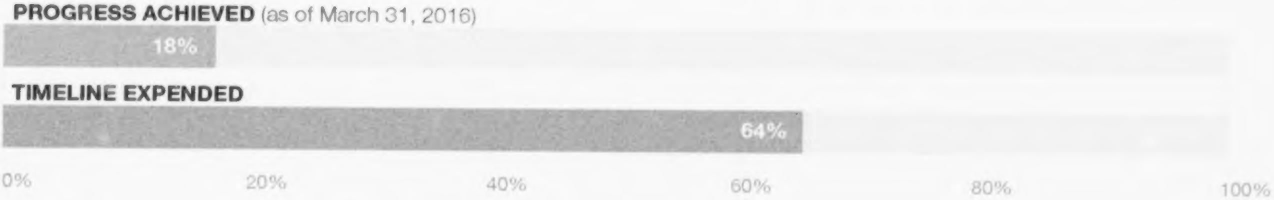
4.5.1. Ontario Public Service Greenhouse Gas Reduction Target

Target	**Reduce greenhouse gas emissions from the Ontario Public Service by 27% by 2020/2021, compared against the 2006 baseline**
Source	2009
Responsibility to Address	Treasury Board Secretariat (as of 2017, MOECC is responsible for this target)
Update (as of March 31, 2016)	GHG emissions reduced by an estimated 81.7 kt (-29.5% from the 2006 baseline)[24] Vehicle fuel consumption: -26.7% CO_2e Air travel: -8.0% CO_2e Energy use in government-buildings: -31.8% CO_2e* * *a large part of the drop in emissions from building energy use is caused by the lower emissions profile of the electricity grid in 2015.*



4.5.2 Ontario Public Service Electric Vehicle Target

Target	**Add 500 electric vehicles to Ontario Public Service fleet by 2020**
Source	2009
Responsibility to Address	Treasury Board Secretariat (as of 2017, MOECC is responsible for this target)
Update (as of March 2016)	The OPS vehicle fleet includes 1,412 hybrid vehicles and 90 electric vehicles, up significantly from just 103 hybrid vehicles in 2006



Endnotes

1. Although not stated, the ECO assumes, unless otherwise indicated, that the quantity of energy specified represents net savings (i.e., adjusted for free riders and other factors).

2. Independent Electricity System Operator, information provided to the ECO in response to ECO inquiry (21 March 2017).

3. Direction from Ontario Minister of Energy to Ontario Power Authority, Re: 2015-2020 Conservation First Framework (31 March 2014).

4. In July 2017, the IESO released 2016 results and also updated 2015 results to incorporate late data. According to the IESO, 2015 and 2016 results total 2.6 TWh of savings that will persist to 2020 (38% of target). Independent Electricity System Operator, IESO Bulletin (6 July 2017).

5. By factoring in unverified 2015 adjustments (accounting for projects completed in 2015, but not reported in time for 2015 verification processes) and 2016 reported results, both of which are currently undergoing verification processes, the Industrial Accelerator Program has achieved 196 GW of the 1.7 TWh target (12%) as of December 31, 2016. If considering savings currently under contract, 616 GWh energy savings or 36% of the Industrial Accelerator Program target has been contracted as of May 31, 2017.

6. **Time-of-use (TOU) pricing**: the observed impact of TOU meters during system peaks; **Industrial Conservation Initiative (ICI)**: the observed impact of ICI over the high-five peaks days based on eligible participants; **Capacity-Based Demand Response (CBDR)**: the quantity of capacity participating in the CBDR program; **Dispatchable Load:** the observed quantity of dispatachable load available during system peak, adjusted for participation in ICI, DR Auction and DR Pilot in order to avoid double counting; **DR Pilot**: the quantity of DR Pilot resources procured, adjusted for participation in the DR Auction in order to avoid double counting; **Peaksaver**: the effective capacity of Peaksaver resources; **DR Auction Target Capacity**: the quantity of capacity the Independent Electricity System Operator seeks to procure through the DR Auction. The quantity is not adjusted for non-performance.

7. The Independent Electricity System Operator transitioned the Demand Response 2 and Demand Response 3 programs to the Capacity Based Demand Response Program in March 2015.

8. Developed by Independent Electricity System Operator in May 2016.

9. The Independent Electricity System Operator (IESO) is in the process of transitioning the Peaksaver PLUS program into an IESO administered market based structure. There was one system wide Peaksaver Plus curtailment event in 2015: July 29th between 2 and 6 pm.

10. A 7% year-over-year growth in the DR Auction target capacity has been instituted in order to meet the target in the 2013 LTEP. (Demand Response Working Group, "Update on Target Capacity and Commitment Period", 30 September 2016)

11. Contracts held by the IESO under a previous Ontario Power Authority Program called Demand Response 3 contracts began to be moved to a transitional market called the Capacity-Based Demand Response (CBDR) program in April 2015. The CBDR program is evolving into a competitive procurement process for demand response capacity using an auction. There is currently 159 MW enrolled in the CBDR program, and the transition schedule is:
    - 37 MW will expire on April 30, 2018, leaving 122 MW in the program;
    - 122 MW will expire on October 31, 2018, after which there will be no capacity enrolled in the CBDR program.

12. Enbridge Gas Distribution, *Multi-Year Demand Side Management Plan (2015 to 2020) Corrected Evidence*, Ontario Energy Board EB-2015-0049 (Scarborough: EGD, 26 June 2015) Exhibit B, Tab 1, Schedule 2, at 3.

13. Ontario Energy Board, *Demand Side Management Framework for Natural Gas Distributors (2015 -2020)*, Report of the Board EB-2014-0134 (Toronto: OEB, 22 December 2014) at 11-12.

14. Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (Scarborough: EGD, 22 April 2016) Table 3.9.

15. Enbridge Gas Distribution, *Multi-Year Demand Side Management Plan (2015 to 2020) Corrected Evidence*, Ontario Energy Board EB-2015-0049 (Scarborough: EGD, 26 June 2015) Exhibit B, Tab 1, Schedule 2, at 3.

16. Ontario Energy Board, *Union Gas Limited and Enbridge Gas Distribution, Applications for Approval of 2015-29020 Demand Side Management Plans*, Decision and Order EB-2015-0029/EB-2015-0049 (Toronto: OEB, 20 January 2016) at 68, 69.

17. Union Gas, *2015 Demand Side Management Draft Annual Report* (Chatham: UG, 22 April 2016) at 70-71.

18. *Ibid* at Table 3.9.

19. Union Gas, *2015-2020 Demand Side Management Plan* (Chatham: UG, 1 April 2015) EB-2015-0029, Exhibit A, Tab 3, at 12.

20. Ontario Energy Board, *Demand Side Management Framework for Natural Gas Distributors (2015 -2020)*, Report of the Board EB-2014-0134 (Toronto: OEB, 22 December 2014) at 11-12.

21. Ontario Energy Board, *Union Gas Limited and Enbridge Gas Distribution, Applications for Approval of 2015-29020 Demand Side Management Plans*, Decision and Order EB-2015-0029/EB-2015-0049 (Toronto: OEB, 20 January 2016) at 68, 69.

22. Ministry of Energy, 2017 Long-Term Energy Plan discussion guide, *Planning Ontario's Energy Future* (Toronto: MENG, 2016) at 37.

23. Environmental Commissioner of Ontario, *Developing the 2017 Long-Term Energy Plan* (Toronto: ECO, 6 December 2016) at 18; Environmental Commissioner of Ontario, *Conservation: Let's Get Serious, Annual Energy Conservation Progress Report – 2015/2016* (Toronto: ECO, 31 May 2016) at 151.

24. Treasury Board Secretariat, information provided to the ECO in response to an ECO information request (24 April 2017):

	Baseline Energy Amount (2006/07)	Energy Consumption in 2009/10	Energy Consumption in 2014/15 (Target Year)	Energy Consump-tion in 2015/16	% GHG Reduction from Baseline						
					09/10	10/11	11/12	12/13	13/14	14/15	15/16
Vehicle Fuel [Litres and kt CO_2e (GHG)]	41,365,508 L 98.3 kt CO_2e	37,638,885 L 89.4 kt CO_2e	32,188,324 L 76.5 kt CO_2e	**30,328,473 L** **72.0 kt CO_2e**	9.1 % CO_2 e	8.3% CO_2e	10.9% CO_2e	16.2% CO_2e	18.1% CO_2e	22.2% CO_2e	**26.7% CO_2e**
Air Travel [km and kt CO_2e (GHG)]	46,978,380 km 5. 6 kt CO_2e	38,184,928 km 4.6 kt CO_2e	39,848,087 km 4.8 kt CO_2e	**43,210,992 km** **5.2 kt CO_2e**	18.7 % CO_2 e	15.8% CO_2e	19.9% CO_2e	25.6% CO_2e	18.5% CO_2e	15.2% CO_2e	**8.0% CO_2e**
Emissions in Facilities*** *(provided by MOI)* [kt CO_2e (GHG)]	2006 Baseline ***173.246 kt CO_2e**	2009 Calendar Year	2014 Calendar Year ****124.417 kt CO_2e**	2015 Calendar Year ****118.199 kt CO_2e**	2009	2010	2011	2012	2013	2014 **28.2% CO_2e from baseline**	2015 **31.8% CO_2e from baseline**
Total: OPS Environ-mental Footprint [kt CO_2e (GHG)]	**277.146 kt CO_2e**			**195.399 kt CO_2e**							**29.5%**

* Baseline will change as a result of changing real estate portfolio. For guidance, the WRI standard for corporate reporting is used as guidance in making baseline adjustments.

**Current reporting year is based on estimate emission factor data supplied by the Ministry of Energy. Data will be trued-up in the next annual report.

***Energy in Facilities data is presented in calendar not fiscal years and includes consumption from the following energy sources: electricity, natural gas, district steam, fuel oil, district hot water, propane and district chilled water.

Chapter 5

Natural Gas Conservation Programs

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Abstract

Natural gas supplies about 37% of Ontario's energy needs. Reducing natural gas use through conservation is important for reducing energy bills and for climate change mitigation.

This chapter reviews 2015 conservation program results (the most recent results available) from Ontario's two major natural gas utilities (Enbridge Gas Distribution and Union Gas), and policy developments in 2016 that directly affect utility conservation programs. 2015 results have yet to be verified by a third party and approved by the Ontario Energy Board and could still change significantly.

Based on draft results, overall natural gas savings for Union Gas were down 17% from 2014, primarily due to a drop in savings from large industrial customers. Enbridge's results were 20% higher than in 2014, due to higher savings from commercial and low-income customers.

Both companies have programs in the residential, commercial and industrial sectors. Programs are also dedicated to low-income residents, at low or no cost to participants. In the residential sector, the focus is on deep home retrofits, a program that has grown rapidly in recent years. Savings from commercial and industrial customers dominate overall program results. However, given the higher cost of electricity, these customers will often favour electricity conservation programs over natural gas programs as the rate of return is higher. This puts natural gas at a conservation disadvantage.

Total conservation spending for both utilities was $68 million in 2015. Cost-effectiveness testing showed that natural gas utility conservation programs make good sense – delivering roughly three dollars in benefits for every dollar spent.

There are greenhouse gas emissions reductions associated with not burning natural gas. For each year of program activity, conservation programs have resulted in a reduction of approximately 0.2% of Ontario's annual greenhouse gas emissions (300,000 tonnes per year). The average abatement cost of conservation from the utility perspective (not even including the savings from purchasing less natural gas) has been around $15 per tonne of carbon emissions, cheaper than the current cost of allowances in the cap and trade program.

In a carbon-constrained economy, gas conservation makes even more sense. This has been reflected in a new six-year conservation framework and expanded budget for natural gas conservation. While 2015 was the first year of the new framework, due to a late start, it served in reality as a transition year that rolled over programs and budgets from 2014. Budgets for both companies combined will increase significantly to just under $120 million per year, beginning in 2016. This is still much less than is spent on electricity conservation.

Given its climate mitigation potential, funding for gas conservation is also being made available by the Ontario government from additional sources, such as the Green Investment Fund and, in the future, potentially the Green Ontario Fund (Ontario's green bank). Careful oversight will be needed to ensure that these initiatives do not conflict and that utility programs continue to be delivered as effectively as possible.

5.1 2015 Program Results

5.1.1 Year One of a New Conservation Framework

Natural gas supplies about 37% of Ontario's energy, mainly to heat homes and buildings, heat water and run factories. In the mid-1990s, the Ontario Energy Board (OEB) decided that Ontario's gas utilities had a role to play in helping their customers reduce energy use and use this natural resource as efficiently as possible. Utilities were tasked with designing and delivering the gas conservation programs (also known as demand-side management or DSM) to their customers and be compensated for doing it, but with oversight by the OEB.

In a carbon-constrained economy, gas conservation makes even more sense. This has been reflected in a new six-year DSM Framework for the period 2015 -2020, established by the OEB.[1] The new framework provides increased budgets for natural gas conservation, and reflects the importance in the Ontario Government's Long-Term Energy Plan of putting conservation first.[2] It is also intended to increase the alignment between gas and electricity conservation activities and so covers the same time period as the electricity conservation framework. The ultimate goal is to ensure that resource savings are achieved as efficiently as possible and that customers receive the greatest opportunities to lower their bill by reducing consumption.[3]

Natural gas supplies about 37% of Ontario's energy.

Because the new framework was not released until December 2014, conservation program activities (budgets, targets, programs) in 2015 were essentially rolled over unchanged from 2014 (with minor exceptions noted later in the chapter). The new framework and expanded budget will take full effect in 2016.

The results reported in this chapter are based on the companies' 2015 unaudited draft results,[4] thus, the findings may change.

5.1.2 Why Reported Results May Change

The conservation program results reported in this chapter are still considered "draft" more than eighteen months after the end of 2015. Why is this so, and what may change?

The transition from draft results to final results can include two major adjustments (i.e., the realization rate and the net-to-gross adjustment), usually done as part of a program evaluation. These adjustments can involve significant work by the evaluator, and are usually based on detailed analysis from a representative sample of projects. A high level of rigour in evaluation is often warranted in order to accurately measure the value of the conservation programs, and because significant financial incentives to the utilities are tied to the final evaluated results.

Realization Rate: A ratio of the final assessment of the energy savings from a conservation project to the original calculated estimate, based on additional information (often gathered through on-site visits or interviews with project participants). Factors that can affect energy savings and lead to a realization rate different than one include: changes in the number of hours a piece of equipment operates; the efficiency difference between the baseline and efficient technology; and the expected operating life.

Net-to-Gross Adjustment: Once the realization rate is calculated, the actual gross energy savings are known, but need to be converted (usually downward) into net savings through a net-to-gross adjustment. The primary input to the net-to-gross adjustment is a correction for free ridership. There will be customers who would have undertaken conservation projects without the programs offered by gas utilities, but they may still participate in order to receive an incentive, and are known as free riders. Savings from these customers are excluded from the net savings attributed to the program, as they would have happened anyway.

All savings reported in this chapter are net savings, but are based on net-to-gross adjustment factors (e.g., a 54% reduction in savings in the case of Union's custom commercial and industrial projects) that may change with the results of the 2015 evaluation.[5] For the mid-term review of natural gas conservation, both companies will be required to show how they have improved program design in order to lower free ridership. Reducing free ridership means that conservation spending is used more effectively and has a larger impact.

For the 2015 evaluation, both the realization rate and the free-ridership rate are being reviewed for custom commercial and industrial conservation projects. As these projects make up the bulk of reported energy savings from conservation, final results could change substantially if changes to either the realization rate or the free-ridership rate are significant. The process for evaluating 2015 results has taken longer than in previous year's due to the change in evaluation oversight to an OEB-led model (and an increased evaluation work load), as noted later in the chapter. Final evaluated results are expected within the next few months.

5.1.3 2015 Overall Natural Gas Savings

Utilities measure both the annual and cumulative natural gas savings from their conservation programs. **Annual savings** is the reduction in natural gas use in the first year after a conservation measure is implemented. **Cumulative savings** adds up the natural gas savings achieved in each year, over the lifespan of a conservation measure. Different life expectancies are attributed to different measures. For example, an efficient showerhead will save a homeowner gas on the hot water used this year, and because the showerhead is expected to last 10 years, the cumulative savings will be 10 times the annual savings.

Cumulative natural gas savings is the primary metric the OEB uses to measure the success of most natural gas conservation programs. This rewards utilities for pursuing long-lasting conservation measures that will deliver savings for many years (e.g., building envelope improvements) and incents utilities to capture as much conservation as possible for the budget provided.

The cumulative natural gas savings (shown by sector) that each utility achieved in each year from 2012 to 2015 are shown in Figures 5.1 and 5.2 for Union and Enbridge Gas Distribution (EGD) respectively. DSM results have been variable. Union's results have declined in the past two years, with overall savings in 2015 being 17% lower than in 2014, and 44% lower than in 2013. This is primarily due to a drop in savings from large industrial customers. EGD's results rebounded slightly in 2015 and were 20% higher than in 2014, due to higher savings from commercial and low-income customers.

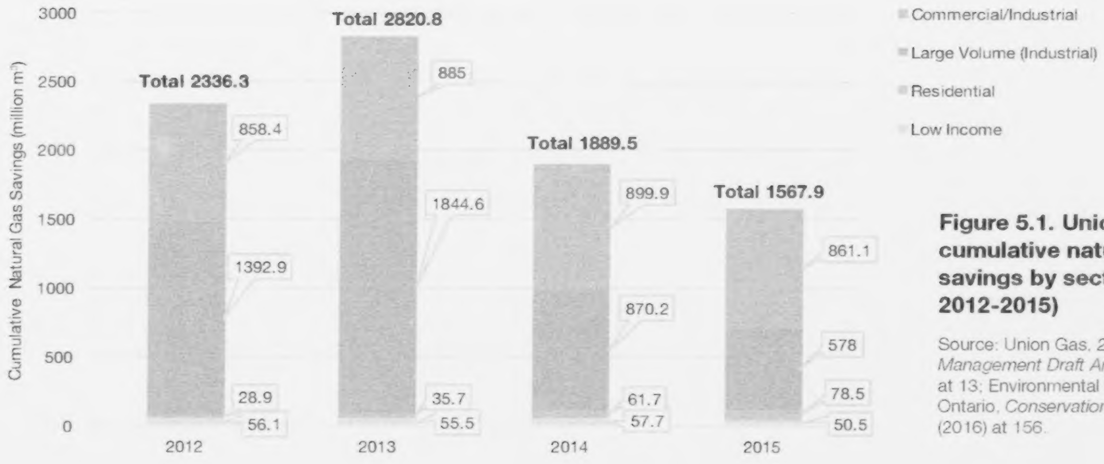

Figure 5.1. Union Gas cumulative natural gas savings by sector (Ontario, 2012-2015)

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 13; Environmental Commissioner of Ontario, *Conservation: Let's Get Serious* (2016) at 156.

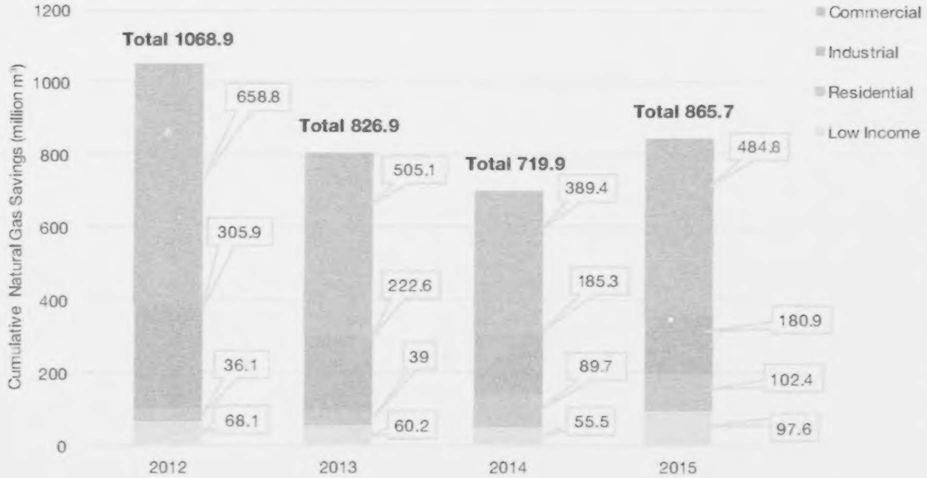

Figure 5.2. Enbridge Gas Distribution cumulative natural gas savings by sector (Ontario, 2012-2015)

Source: *Enbridge Gas Distribution. 2015 Demand Side Management Draft Annual Report* (2016) at 27; Environmental Commissioner of Ontario, *Conservation: Let's Get Serious* (2016) at 156.

Annual net gas savings are also a useful measure of conservation impact, as they can be compared with annual utility gas sales to determine how much impact conservation is having on overall gas consumption. This is shown in Table 5.1. It can be seen that that the volumes saved as a percentage have remained more or less constant over the past three years, Union achieving a greater percentage than EGD. On average, all of the conservation projects delivered in a year reduce gas consumption by 0.5-1%. Of course, most projects deliver savings for more than one year. If we assume that all conservation measures installed from 2007 onwards were still delivering savings in 2015 (a slight overestimate), gas use in 2015 was 8% lower than it would otherwise have been for Union, and 5% lower for EGD, due to utility conservation programs.[6]

Table 5.1. Net Annual Gas Savings From Conservation as a Percentage of Overall Utility Gas Sales

	2012	2013	2014	2015
Enbridge	0.6%	0.4%	0.4%	0.4%
Union	1.0%	1.3%	0.9%	0.8%

Note: Percentage of gas sales excludes sales to the small number of utility customers in rate classes not eligible for conservation programs.

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 10; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 23.

> Gas use in 2015 was 8% lower than it would otherwise have been for Union, and 5% lower for Enbridge, due to utility conservation programs.

5.1.4 Greenhouse Gas Emissions Reductions

For every cubic metre of natural gas not combusted due to conservation, there is an associated reduction in greenhouse gas (GHG) emissions. When combusted, natural gas emits primarily carbon dioxide, with minor amounts of methane that is not combusted and nitrous oxide. The ECO's estimate of the GHG reductions due to utility conservation programs is shown in Table 5.2. Each year, net annual savings from DSM programs, described above, have resulted in a reduction of approximately 0.2% of Ontario's GHG emissions.

Table 5.2. Annual Greenhouse Gas Emissions Reductions (t CO_2e) from Gas Utility Conservation Programs (2012 – 2015)

	2012	2013	2014	2015
Enbridge Emissions Reductions	112,703	88,940	81,115	94,491
Union Emissions Reductions	256,042	335,278	245,590	203,522
Total Emissions Reductions	368,744	424,218	326,705	298,013
Overall Ontario Emissions (Rounded)	171,000,000	171,000,000	168,000,000	166,000,000
Emissions Reductions From Conservation as a % of Overall Ontario Emissions	**0.22%**	**0.25%**	**0.19%**	**0.18%**

Note: Does not include reductions in upstream emissions. The emissions factors used are the same as for when reporting greenhouse gas emissions to the Ministry of the Environment and Climate Change.[7]

Source: ECO calculation[8] based on net annual natural gas savings provided in: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 10; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 22; Environment and Climate Change Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada*, Part 3 (2016) at 58.

5.1.5 Program Budget and Spending

The results that can be achieved from conservation programs depend on the budget provided. The budget needs to have a reasonable rate impact but still provide sufficient opportunity to the companies to pursue cost-effective conservation opportunities. As shown in Figure 5.3, under the new conservation framework, the OEB has significantly increased the utility conservation budget beginning in 2016 until 2020, resulting in an annual average budget of about $60 million for Enbridge and $57 million for Union.[9] This increase will support an expanded delivery of DSM programs across all customer classes, and responds to the Minister of Energy's direction that the gas conservation framework should enable the achievement of all cost-effective DSM. The increased budget for gas conservation, while higher than most North American jurisdictions, is still only about one-third of what will be spent on electricity conservation in the same time period based on the IESO approved budget for 2015-2020 of $2.2 billion.[10] The OEB also decided that the rate impact on a typical residential gas customer should not be more than $2/month.

> The increased budget for gas conservation is still only about one-third of what will be spent on electricity conservation.

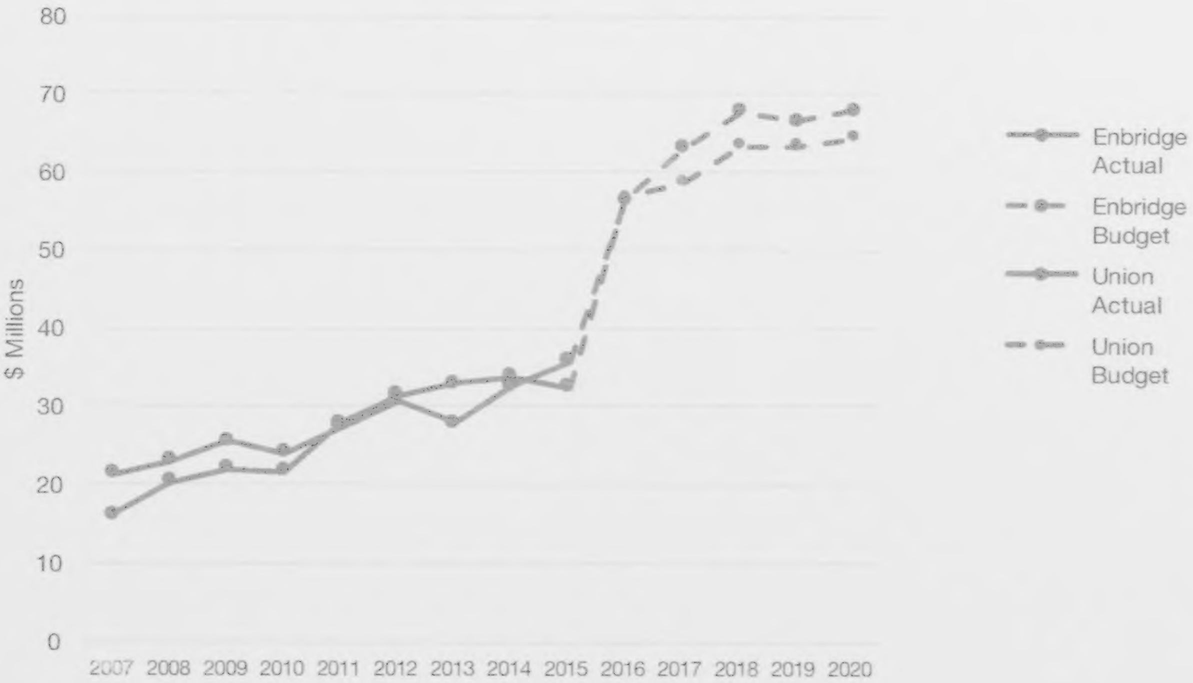

Figure 5.3. Historical spending and forecast budget for natural gas utility conservation (Ontario, 2007-2020)

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 8; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 19-20.

In 2015, conservation budgets and spending were lower than this. This is because the new framework was not finalized until December 2014, so DSM program budgets for both utilities were kept at 2014 levels for 2015.

In their 2015-2020 plans, EGD and Union both identified additional initiatives and spending for 2015, over and above the 2015 program budgets, that would help transition to the higher level of program activity planned for 2016-2020. Projected 2015 spending for these incremental items amounted to $4.92 million for EGD and $1.4 million for Union. These amounts were not built into their rates but would require approval by the OEB at a later date.

DSM budgets and actual spending for both 2015 programs and incremental activities are shown in Table 5.3. Total DSM spending for both utilities was $68 million in 2015. Both utilities spent their full program budgets, with Enbridge spending several million dollars more, due to the popularity of its Home Energy Conservation program (utilities are allowed to access some additional funding if programs are more successful than anticipated). Union spent 4% of its revenue and EGD spent 3.4% of its revenue on DSM programs in 2015.

The story was different for spending on incremental activities. Given the uncertainty surrounding the OEB's approval of this spending (which was eventually given, but not until January 2016), neither company ended up spending more than a small portion of their incremental funding.

Table 5.3. 2015 DSM Budget vs Spending for the Gas Utilities

Activity	**Enbridge**		**Union**	
	2015 Budget ($)	**2015 Actual Spending ($, % of Budget)**	**2015 Budget ($)**	**2015 Actual Spending ($, % of Budget)**
2015 DSM Programs	32,801,939	35,220,594 (107%)	32,587,879	32,178,765 (99%)
Incremental Spending on New Framework Activities	4,920,291	559,378 (11%)	1,400,000	213,879 (15%)
Totals	**37,722,230**	**35,779,972 (95%)**	**33,987,879**	**32,392,645 (95%)**

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 73; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 106.

5.1.6 Cost-Effectiveness

In order to ensure that DSM provides value to customers, the OEB requires that most programs pass a cost-benefit test before being offered. The required test has been the Total Resource Cost (TRC) test, which compares the costs of conservation (primarily the program administration cost and the incremental cost of energy-efficient technologies) against the benefits (primarily the financial value of energy savings). In the new framework, the test now increases the benefits by including a 15% adder to account for the non-energy benefits (including emissions reductions) associated with the programs. This modiified test is referred to as the TRC-Plus test. Whether using the TRC or TRC-Plus test, a value of greater than one indicates that a program is expected to be cost-effective.

Cost-benefit calculations are performed again after programs have been delivered. Enbridge adopted the TRC-Plus test in reporting 2015 results, while Union will do so in 2016. In 2015, Union's portfolio had a TRC ratio of 2.73, indicating program benefits were almost three times as high as the costs. Enbridge's results showed a TRC-Plus ratio of 3.61. This cannot be directly compared with Union's results due to the difference in the test used.

Costs and benefits can also be looked at from the perspective of the utility. How much does the utility need to pay to save a cubic metre of gas? In simple terms, the total DSM program cost in 2015 was $68.173 million[11] (including the cost of initiatives that did not have directly measurable gas savings, but excluding shareholder incentives) and the total cumulative gas savings were 2,433,699,754 m^3.[12] The (non-discounted) cost per cubic metre of gas saved is 2.8¢/m^3.

Put into the context of Ontario's carbon price (as established by its new cap and trade program), 2.8 ¢/m^3 would be equivalent to paying $15/t CO_2e over the lifetime of the conservation measures.[13] This price is lower than the market price of GHG allowances, which was established at just over $18/t CO_2e in Ontario's first two auctions. What's more, this estimated cost of conservation does not even include the additional benefits for natural gas distributors that would accrue from distributing less gas.

These results suggest that utilities should examine spending more on conservation (beyond their approved DSM budgets), as part of their cap and trade compliance plans (see Section 5.2.2). Over the long term, more conservation may be a less expensive way to meet cap and trade compliance obligations than purchasing allowances, although this is not guaranteed (the incremental cost of conservation tends to increase as more conservation programs are implemented.) This will benefit gas customers who will bear the full burden of the cost of purchasing cap and trade allowances. In other words, when conservation is cheaper for customers than cap and trade allowances, it should be turned to first.

> Utilities should examine spending more on conservation as part of their cap and trade compliance plans.

5.1.7 Program Highlights by Sector

As can be seen in Tables 5.4 and 5.5, both companies offer a variety of programs targeted to all customer segments. A brief description is given for each program as well as the program activity, savings achieved, spending, and cost-effectiveness.

Table 5.4. Summary of Enbridge's Natural Gas DSM Programs and 2015 Program Results

Sector	Program	Description	2015 Program Activity	Cumulative Net Gas Savings (m^3)	Program Spending ($)	Cost-Effectiveness: TRC-Plus Ratio[1]
Residential	Home Energy Conservation	Deep energy retrofit program designed to achieve at least 25% reduction in natural gas use in existing homes, through measures including building insulation, upgrades to space and water heating equipment, and window replacements.	5646 participating homes	102,415,214	9,362,295	2.51
Commercial	Commercial Custom	Capture energy efficiency opportunities in commercial buildings, including retrofits at time of replacement, such as installing high efficiency boilers, controls and building automation systems. Incentives of $0.10/$m^3$ of annual gas savings.	563 projects	383,391,165		4.01
	Commercial Prescriptive	Fixed incentives for installation of prescriptive and quasi-prescriptive energy-efficient technologies in commercial buildings that impact space and water heating and food service equipment. Measures include demand control ventilation, small condensing boilers, and infrared heaters.	16,877 units	98,693,722		8.51
	Run It Right/Energy Compass	Encourage building owners to improve energy performance through low cost/no cost operational improvements and benchmarking. Energy Compass targets commercial customers who have a portfolio of buildings	28 participants	2,684,105		0.34
		All Commercial Programs		**484,768,992**	**6,221,724**	**4.34**

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[1] Ratio of benefits to costs. The higher the value, the more cost-effective the program. A value >1 indicates benefits exceed costs.

Industrial	Custom Solutions	Support for custom energy efficiency projects for larger industrial customers with significant process loads, accompanied by technical assistance and a continuous improvement approach. Incentives of $\$0.20/\text{m}^3$ for first 50,000 m^3 of annual savings, and $\$0.05/\text{m}^3$ above this.	116 projects	173,268,781		6.69
	Prescriptive	Fixed incentives for installation of prescriptive energy-efficient technologies in industrial applications, with a focus on air curtains and infrared heaters.	235 units	7,593,008		5.10
	All Industrial Programs			**180,861,789**	**2,166,706**	**6.60**
Low Income	Single Family (Home Winterproofing)	Offered to low income residents in single-family homes and low-rise multi-family homes, at no cost to participants. Focus on insulation and air sealing, as well as additional measures such as programmable thermostats and efficient showerheads.	1343 projects (586 social housing, 757 privately owned)	28,343,978	4,444,616	1.29
	Multi-Residential	Offered to low-income multi-residential buildings, social housing buildings, plus privately owned multi-residential buildings with a high proportion of low-income residents (City of Toronto only). A mixture of custom incentives and prescriptive incentives for building owners (higher incentives than in the commercial program). Free in-suite measures also provided to tenants.	96 projects	69,226,782	2,111,746	4.29
	Low Income Building Performance Management	Provides managers of low income multi-residential buildings with energy consumption information and benchmarking reports, as well as assistance to identify energy efficiency opportunities.	121 participating properties	Not tracked		Not applicable
	All Low Income Programs			**97,570,759**	**7,173,710**	**2.46**

Market Transformation	Residential Savings By Design	Promote use of the integrated design process to encourage construction of new homes to an energy efficiency standard 25% above the Ontario Building Code.	19 builders enrolled, 1987 new homes built in 2015 to higher standard	Not tracked	2,032,022	Not applicable
	Commercial Savings By Design	Promote use of the integrated design process to encourage construction of new commercial (part 3) buildings to an energy efficiency standard 25% above the Ontario Building Code. Offered to developments larger than 100,000 square feet.	24 new developments enrolled	Not tracked	890,464	Not applicable
	Home Labelling	Encourage realtors to use home energy ratings for resale homes.	10 new participating brokerages, 336 home ratings performed	Not tracked	121,241	Not applicable

Note: Program spending does not include overhead costs that are not associated with a specific program, thus costs are somewhat understated, and cost-effectiveness results are overstated. These overhead costs are included in the spending and cost-effectiveness results presented for the entire utility portfolio of conservation programs in Sections 5.2.4 and 5.2.5.

Source: Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at multiple locations.

Table 5.5. Summary of Union's Natural Gas DSM Programs and 2015 Program Results

Sector	Program	Description	2015 Program Activity	Cumulative Net Gas Savings (m^3)	Program Spending ($)	Cost-Effectiveness: TRC Ratio[a]
Residential	Energy Savings Kit	Pre-packaged measures to help reduce space and water heating provided at no cost to the customer. Delivery was either door-to-door or via online requests.	Distributed 19,753 kits and 1240 programmable thermostats	19,567,373		
	Home Reno Rebate	Home retrofit program designed to encourage home owners to install two or more measures to get significant energy savings and improved indoor air quality. Must achieve a minimum lifetime gas savings of 11,000m^3 using the HOT 2000 software. Rebates depend on the measure installed.	2541 participating homes	58,923,165		
	All Residential Programs			**78,490,538**	**5,450,210**	**1.22**
Commercial/ Industrial	Prescriptive/Quasi-Prescriptive	Measures have pre-determined savings based on the size and classification of the equipment. Incentives vary depending on the initiative installed. Consists of water heating, space heating, commercial kitchen initiatives.	3042 units	183,095,952	4,071,045	2.43
	Custom	Provides incentives for education and energy audit assessments, and for energy savings for custom projects outside the scope of prescriptive measures.	588 projects	678,002,610	7,297,352	3.06
	All Commercial/Industrial Programs			**861,098,562**	**11,368,397**	**2.91**
Low Income	Affordable Housing Conservation	Targets multi-family social and assisted housing market with custom and prescriptive measures. Increased incentives are also provided to help implement measures.	131 units	16,965,778		
	Home Weatherization Program	Provides low-income customers in single family homes with a free home energy audit and upgrades including various insulation measures. Other basic measures are also provided at the time of audit if they have not previously received them.	1472 participating homes	33,504,841		
	All Low Income Programs			**50,470,619**	**7,701,035**	**0.85**

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[a] Ratio of benefits to costs. The higher the value, the more cost-effective the program. A value >1 indicates benefits exceed costs.

Market Transformation	Optimum Home Program	Designed to accelerate residential home builder's energy efficiency practices to 20% above Code. Program consists of three phases 1) Discovery - builder to build one home to new energy standard; 2) Production - test new building, lessons learned, training needs; 3) Transformation - full implementation to new production standards.	50.3 % of homes built by participating builders met higher efficiency standard.	Not tracked	1,405,340	Not applicable
Large Volume	Rate T2	These customers can directly access their customer incentive budget they pay in rates to identify and implement energy efficiency projects. This is a "use it or lose it" approach. Incentives also available for process improvement, feasibility studies, and metering.	92 projects	462,016,235		
	Rate 100	As for rate class T2.	18 projects	37,087,125		
	Rate T1	Incentives available for process improvement, feasibility studies, metering and custom energy efficiency projects.	40 projects	78,919,835		
		All Large Volume Programs		**578,023,195**	**3,209,716**	**4.68**

Note: Program spending does not include overhead costs that are not associated with a specific program, thus costs are somewhat understated, and cost-effectiveness results are overstated. These overhead costs are included in the spending and cost-effectiveness results presented for the entire utility portfolio of conservation programs in Sections 5.2.4 and 5.2.5.

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at multiple locations.

Some points of interest in the 2015 programs are noted below.

Residential Programs

- Both utilities have seen increased participation in their deep retrofit programs.
    - In Enbridge's case, the program proved a victim of its own success, as excess demand led to the program being temporarily suspended in mid-year due to budget constraints (it was restarted in 2016). Some flexibility is provided to utilities to move funds between programs and access incremental funds for particularly successful programs, but this was not enough for Enbridge to meet program demand for the full year.

Both utilities have seen increased participation in their deep retrofit programs.

    - Union also offered a highly successful home retrofit program (2015 participation levels were 2.5 times greater than 2014). This program (Home Reno Rebate) is designed to encourage home owners to install two or more measures to get energy savings, which must achieve a cumulative savings of 11,000 m^3. There has been reluctance to promote this program by some contractors, fearing it will impact their timely sale of HVAC equipment.[14]

  - In 2015, Union began promoting this program to townhouses and semi-detached homes (previously only detached homes were targeted) and over 100 homes of this type participated.

- Union's Energy Savings Kit (offering free water pipe insulation, low-flow showerheads, and faucet aerators) was discontinued after 2015 as a result of the OEB's decision on 2015-2020 DSM plans. Both utilities have offered this type of program for many years, and the OEB is of the view that the market for these measures is saturated. Enbridge exited this offering several years ago.

Commercial and Industrial Programs

- Both commercial and industrial customers must balance competing energy efficiency projects between natural gas and electricity programs, with a limited budget. With natural gas costs being low in comparison to electricity, the return on any energy efficiency investment will likely weigh more in the favour of electrical CDM activities to the detriment of natural gas DSM activities. This was noted as a concern by Enbridge and Union. For greenhouse gas reductions, natural gas conservation is likely more important than electricity conservation.

- Efforts are needed to reach smaller customers who have historically had little participation in conservation programs. Enbridge has set up a dedicated sales team to reach these smaller commercial customers and Union also flagged the need to increase awareness of conservation in this segment. This became a larger focus of program activity from 2016 forward.

- Enbridge's Run it Right program, which motivates improved energy performance in buildings through benchmarking and operational improvements, was not cost-effective, based on monitored year-to-year differences in energy consumption. Enbridge has found it difficult to accurately measure the energy impact of operational improvements, as these are often outweighed by other year-to-year differences that affect building consumption.

- Union has a direct access budget mechanism for its largest industrial customers, that allows these customers to have first access to a conservation budget (funded from their rates) that can be used to implement energy savings projects. This program had high participation rates: 97% of eligible customers submitted energy efficiency plans and 78% completed at least one project, although only 33% utilized their entire budget.

Utilities have expanded their low-income programs in large multi-family buildings beyond social housing.

Low-Income Programs:

- Utilities have expanded their low-income programs in large multi-family buildings beyond social housing to private buildings with a high percentage of low-income residents. Union had a successful low-income market rate multi-family demonstration project in 2015 (this segment was not previously eligible for this program), while Enbridge had already made this building segment eligible, although only within the City of Toronto.

- Enbridge worked with Toronto Hydro to develop a pilot to integrate their respective low-income programs for single-family homes, and achieve both gas and electric savings in a single program with one application and delivery channel. If successful, the intent is to apply this model across the province.

Market Transformation Programs

- Enbridge's Savings By Design program encourages beyond-Code energy efficiency levels in commercial new construction. Enbridge has recognized that building types other than condos represent an opportunity to secure additional savings and has begun to target these developments, including schools, offices, churches and long-term care facilities.

- Enbridge exited the voluntary home labelling program. The goal of this program was to promote the value of voluntary home energy ratings to buyers and sellers in the residential resale market, but the program did not ultimately prove successful in convincing realtors and clients to undertake home energy ratings as part of home sales.

- Union's Optimum Home program is intended to accelerate residential home builders' energy efficiency practices. By the end of 2015, nineteen of the top fifty builders in Union's franchise area had advanced to the production and final transformation phases of the program.

5.1.8 Performance Against Targets

Utility performance on conservation is measured by the OEB against a complicated "scorecard" of targets. The 2015 targets were rolled over from 2014. Each utility is still eligible for performance incentives scaled to their performance against targets, paid for by ratepayers through natural gas rates. The most important targets for utilities are the cumulative natural gas savings achieved from their combined suite of resource acquisition programs in the industrial, commercial and residential sectors. However, the scorecards also include additional targets for progress on more specific conservation program goals. The 2015 draft conservation results in comparison to their targets for Enbridge Gas Distribution and Union Gas are shown in Table 5.6.

Table 5.6. Summary of 2015 DSM Performance Metrics Against OEB-Established Targets for Enbridge and Union Gas

		Enbridge			Union		
Component	**Performance Metric**	**Weight %**	**Median Target With Upper and Lower Boundaries**	**Results**	**Weight %**	**Median Target With Upper and Lower Boundaries**	**Results**
Resource Acquisition							
Gas savings from residential, commercial and industrial market segments	**Cumulative savings (million m^3 gas)**	92	1,011.9 ∓ 25%	768.05	90	816.6 ∓ 25%	939.5
Residential deep savings	**Number of participating homes, achieving 25% gas savings in aggregate**	8	762 ∓ 25%	5,646	5	1245 ∓ 25%	2,537
Commercial/industrial deep savings	**% reduction in baseline consumption among all custom projects**	Not Applicable			5	8.88% ∓ 1%	8.24%
Low Income							
Single-family	**Cumulative savings (million m^3 gas)**	50	24.1 ∓ 25%	28.[illegible]4	60	26 ∓ 25%	33.5
Multi-family (part 3)	**Cumulative savings (million m^3 gas)**	45	68.7 ∓ 25%	69.23	40	17.6 ∓ 25%	16.9
Low Income Building Performance Management	% of part 3 conservation participants enrolled in benchmarking program	5	40% ∓ 10%	65%	Not Applicable		

		Enbridge			Union		
Market Transformation							
Residential Savings by Design	**Number of completed units built to 25% higher than Code**	40%	1111 ∓ 25%	1,987	Not Applicable		
	Number of builders enrolled	60%	18 ∓ 33%	19			
Commercial Savings by Design	**Number of new developments enrolled**	100%	18 ∓ 33%	24	Not Applicable		
Home Labelling	**Number of listings by realtors committed to providing data field for energy rating**	50%	5000 ∓ 100%	41,650	Not Applicable		
	Number of home ratings performed by buyers and/or sellers	50%	4500 ∓ 50%	336			
Optimum Home	**% of homes by participating builders built to 20% above Code**	Not applicable			100%	30% ∓ 5%	50.3%
Large Volume							
Rate T1	**Cumulative natural gas savings (million m^3)**	Not applicable			60%	206.256 ∓ 25%	78.919
Rate T2	**Cumulative natural gas savings (million m^3)**	Not applicable			40%	1029.841 ∓ 25%	499.103

RED	**Below lower band of target**
YELLOW	**Between lower and upper bands of target**
GREEN	**Above upper band of target**

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 70-71; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 26.

In order to motivate the gas utilities to pursue DSM aggressively, the OEB has approved a shareholder incentive which rewards utilities for performance. Based on the 2015 draft pre-audit results, the utilities could be eligible for $17.866 million in incentives ($10.318 million for Enbridge Gas Distribution and $7.548 million for Union Gas). EGD could be eligible for about 93% of its maximum incentive payment, and Union eligible for 69% of its maximum, as shown in Table 5.7.

The OEB has not yet approved the 2015 incentive payments, as the reports are still in draft and are unaudited.

Table 5.7. Shareholder Incentive Amounts Earned and Available for 2014/2015

	Incentive Earned (thousand $)	Max. Incentive (thousand $)	Incentive earned as % of Max.	Earnings as a % of DSM spending	Incentive Earned (thousand $)	Max. Incentive (thousand $)	Incentive earned as % of Max.	Earnings as a % of DSM spending
	2015				2014			
Enbridge	10,320	11,090	93%	29%	7,650	10,870	70%	24%
Union	7,548	11,002	69%	23%	8,988	10,820	83%	27%

Source: Union Gas, *2015 Demand Side Management Draft Annual Report* (2016) at 9; Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (2016) at 21.

5.2 2016 Policy Developments Affecting Natural Gas Conservation Programs

5.2.1 Cap and Trade Funding for Home Retrofits and Other Gas Conservation Measures

In February 2016, the government announced that $100 million from the Green Investment Fund (a "down payment" for initiatives expected to be eligible for funding from cap and trade proceeds) would be flowed to Union Gas and Enbridge to help an estimated 37,000 homeowners undertake energy audits and retrofits.[15]

Union and Enbridge will use the funding for the same retrofit program they already offer, but will be able to reach more customers. Eligibility for this program will extend beyond homeowners who heat their homes with natural gas to homeowners using oil, propane, wood, and electricity, and to homeowners outside of the Enbridge and Union service territories. The Green Investment Fund dollars address the concern of program demand outstripping budget, which forced Enbridge to suspend their home retrofit program in mid-2015. Both companies expect that the additional funding provided through the Green Investment Fund will allow them to meet program demand through the end of 2018.[16]

The program was launched on October 31, 2016 and by year end, the utilities had already provided incentives for more than 1,600 home audits and retrofits.[17]

After the conclusion of our reporting year, Ontario released the final regulation that governs the Ontario Climate Change Solutions Deployment Corporation on February 17, 2017.[18] The corporation is is now referred to as the Green Ontario Fund, and was described in Ontario's Climate Change Action Plan as a "green bank". The objective of this corporation is to drive the deployment of commercially available technology that reduces greenhouse gas emissions from buildings or from the production of goods made in Ontario. This fund is directed towards commercial enterprises as well as homeowners. Its focus will be on reducing market barriers to the adoption of new low carbon technologies, by improving information access, providing incentives and using financial de-risking tools. Activities covered by this financing activity include fuel-switching, use of

There is potential for confusion and overlap between the existing electric and gas utility DSM programs and those being funded by the Green Ontario Fund.

energy storage and renewable energy and deep energy retrofits. Starting in 2018, Ontario will provide up to $1.1 billion from the cap and trade auction proceeds. The program has not started yet. There is potential for confusion and overlap between the existing electric and gas utility DSM programs and those being funded by the Green Ontario Fund, which will need to be addressed. A planned Memorandum Of Understanding between the Green Ontario Fund and the Ontario Ministry Of Environment and Climate Change is intended to address these potential conflicts.[19]

5.2.2 Cap and Trade Compliance Plans and Charges on Customer's Bills

In December 2016, the Board set natural gas rates to include the anticipated costs of cap and trade compliance with the new rates taking effect in January 2017.[20] The average homeowner in Ontario uses about 2,400 m^3 of natural gas per year,[21] which produces 4.5t CO_2e/year. The ECO estimates that this will translate into a price increase of roughly $7/month, using an average price of $18.40/t. For commercial enterprises, for example, a customer using 50,000 m^3/year, this will translate into an added cost of about $1,700/year.

In theory these price increases should spur increased interest in customers wanting to participate in the gas company's DSM programs to reduce the amount of natural gas they use to reduce their costs today and in the future in the event that the price of carbon allowances increases.

Both Union and Enbridge filed their first cap and trade compliance plans with the OEB in 2016 (covering the 2017 year only), indicating how they would meet their compliance obligations at reasonable cost to ratepayers. In theory, utilities could have proposed incremental conservation activities if they believed this would be cheaper than purchasing allowances. This was not done in the initial plans but may be pursued by utilities in future compliance plans.

5.2.3 Natural Gas Conservation Potential Study

In June 2016, ICF International completed a natural gas conservation potential study for the Ontario Energy Board (the ECO participated as an observer on the working group that assisted in the development of this study).[22]

This study asked how much natural gas use in Ontario could be reduced out to 2030 through conservation – this is defined as the achievable potential. Achievable potential is determined by assessing the technical potential for all mainstream natural gas efficiency measures, determining what percentage of this is economic (benefits outweigh costs) and then what percentage of the economic potential can realistically be achieved. The TRC-Plus test was the benefit/cost test used in this study.

The study found that there is a technical potential to reduce natural gas use by 46% by 2030 relative to the reference case (see Table 5.8). Selecting only measures that were economic, natural gas use could be reduced by 27% in 2030. The estimated achievable potential was lower still, as it is dependent on the realistic market penetration rates for programs and the budget utilities would have to incent conservation projects among their customers. The impact of carbon pricing was not directly measured, but was simulated through a sensitivity analysis that increased the value of avoided natural gas by 50%. This increase in gas costs had the impact of making more conservation measures cost-effective, increasing the economic potential savings by 24% in 2030.[23]

There is a technical potential to reduce natural gas use by 46% by 2030.

Table 5.8. Natural Gas Conservation Potential Study Results

Year	Projected Natural Gas Use – Reference Case (million m^3)	Potential Savings From Conservation (million m^3, % reduction in gas use from reference case)				
		Technical Potential	**Economic Potential**	**Achievable Potential – Budget Unconstrained**	**Achievable Potential – Budget Semi-Constrained**	**Achievable Potential – Budget Constrained**
2020	26,306	9,233 (-35.1%)	6,448 (-24.5%)	1,869 (-7.1%)	1,338 (-5.1%)	1,187 (-4.5%)
2030	27,962	12,896 (-46.1%)	7,409 (-26.5%)	4,973 (-17.8%)	3,468 (-12.4%)	2,510 (-9.0%)

Note: Unconstrained potential is based on a conservation budget sufficient to fund the full incremental cost of conservation projects; semi-constrained assumes a gradually increasing budget that is double the approved 2016 conservation budget by 2020 and onwards, and constrained assumes a conservation budget that matches the 2015-2020 budgets set by the OEB, and remains at 2020 levels in subsequent years.

Source: ICF International, *Natural Gas Conservation Potential Study: Final Report* (2016) at iv.

The conservation potential study was a requirement in the Minister of Energy's March 26, 2014 directive to the OEB.[24] The purpose of the study is to inform conservation program design and delivery (complementing utility efforts), and to assist the OEB in determining whether the savings targets and budgets for natural gas utility conservation are appropriate. The results of the study will likely be used as part of the mid-term review of the natural gas conservation framework (to be completed in 2018), and perhaps for the next framework, beyond 2020.While this study was quite well done, its estimates of conservation potential are only an approximation. Weaknesses of this type of study include an imperfect approximation of the potential for conservation through operational and behavioural changes, and an inability to develop a complete list of conservation technologies and predict how these will change in the future. The ECO is of the view that the conservation potential study should only be used as one piece of evidence among many in determining appropriate targets and budgets for utility conservation.

5.2.4 Ontario Energy Board Evaluation of Conservation Program Results

The final conservation results for 2015 need to be approved by the Ontario Energy Board before financial incentives are paid out to utilities. Because of the large incentives involved, this evaluation is quite thorough. The most important tasks are to determine whether the amount of reported gas savings is accurate, and what influence the utility program had on the customer decision to undertake the conservation project (i.e., the conversion from gross savings to net savings). Most effort is devoted to evaluating larger custom commercial and industrial conservation projects, given their greater contribution to gas savings and incentives.

2015 is the first year in which conservation results will be evaluated by a contractor reporting to Ontario Energy Board staff (the ECO participates as an observer on the advisory committee that supports this evaluation). This change should give the Board greater confidence that the evaluation results are accurate and that the incentive payments to utilities are justifiable and in the best interests of gas customers.

Significant evaluation work was undertaken in 2016, including developing an evaluation plan for the length of the DSM framework and a more detailed scope of work for the evaluation of 2015 results. However, the actual evaluation of 2015 results (including a new study of program free-ridership) did not really get underway until 2017, and is not expected to be finalized until summer 2017, some sixteen months after the utilities submitted their initial 2015 reports to the Board. This has raised some concerns from utilities, as any conclusions reached in the 2015 evaluation (e.g., changes to the free-ridership rates) will also impact 2016 and 2017 results and incentives, but are provided too late for the utilities to alter their programs in these years.

Endnotes

1. Ontario Energy Board, *Demand Side Management Framework for Natural Gas Distributors (2015- 2020)*, EB-2014-1034 Report of the Board (22 December 2014).

2. Ontario Ministry of Energy, *Planning Ontario's Energy Future, a Discussion Guide to Start the Conversation* (2017).

3. Ontario Energy Board, *Demand Side Management Framework for Natural Gas Distributors (2015- 2020)*, EB-2014-1034 Report of the Board (22 December 2014) at 1.

4. Union Gas, *2015 Demand Side Management Draft Annual Report* (22 April 2016); Enbridge Gas Distribution, *2015 Demand Side Management Draft Annual Report* (22 April 2016) online: <www.oeb.ca/industry/policy-initiatives-and-consultations/natural-gas-demand-side-management-dsm>.

5. Ontario Energy Board, *Union Gas Limited and Enbridge Gas Distribution Inc., Applications for approval of 2015 – 2020 demand side management plans*, Decision and Order, EB-2015-0029/EB-2015-0049 (20 January 2016) at 74.

6. The sum of annual savings from 2007-2015 conservation programs is 1028.9 million m^3 for Union Gas and 575.3 million m^3 for Enbridge, in comparison with 2015 gas sales of 13,405 million m^3 for Union Gas and 11,728.3 million m^3 for Enbridge.

7. Ministry of the Environment and Climate Change, *Guideline for Greenhouse Gas Emissions Reporting* (Toronto: MOECC, December 2015) at 86 (Appendix 10, Tables 20.3 (for CO_2) and 20.4 (for CH_4 and N_2O)).

8. Calculation: volume of net natural gas savings multiplied by the combined global warming potential of the three GHGs associated with natural gas combustion:

Greenhouse Gas	Emission Rate (kg/m^3)		Global Warming Potential
CO_2	1.863	kg/m^3	1
CH_4	0.000037	kg/m^3	21
N_2O	0.000033	kg/m^3	310
Total	**1.875 kg CO_2e/m^3 natural gas combustion**		

For example, using Enbridge's 2012 annual natural gas savings = 60.14 million m^3 x 1,875 tonnes CO_2e/million m^3 = 112,703 tonnes CO_2e.

9. Ontario Energy Board, *Union Gas Limited and Enbridge Gas Distribution Inc., Applications for Approval of 2015 – 2020 demand side management plans*, Decision and Order, EB-2015-0029/EB-2015-0049 (20 January 2016) at 56.

10. Does not include spending on demand response.

11. Spending of $35,779,972 for Enbridge and $32,392,645 for Union. This spending includes all direct and indirect costs associated with DSM, but does not include shareholder incentives earned by Enbridge and Union.

12. Cumulative net gas savings from 2015 programs of 1,568,083,000 m^3 for Union and 865,616,754 m^3 for Enbridge.

13. Calculation: utility cost to acquire conservation = 2.8¢/m^3; 1 m^3 = 1.87 kg CO_2e; (0.028/1.87) x1000 = $14.98.

14. Union Gas, 2015 *Demand Side Management Draft Annual Report* (22 April 2016) at 27.

15. Ontario Ministry of Energy, News Release, "Ontario Investing $100 million to Create Jobs and Help Homeowners Save Energy" (4 February 2016).

16. Personal communication, Enbridge Gas Distribution (20 June 2017).

17. Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry (21 March 2017).

18. *Ontario Climate Change Solutions Deployment Corporation*, O Reg 46/17 made under the *Development Corporations Act*.

19. "Ontario Creates Green Bank to Fund Low-Carbon Tech", online: Aird and Berlis LLP <energyinsider.ca/index.php/ontario-creates-green-bank-to-fund-low-carbon-tech/>. [Accessed 30 June 2017]

20. "Backgrounder Natural Gas Rate Changes -January 2017", online: Ontario Energy Board <www.oeb.ca/oeb/_Documents/QRAM/backgrounder_qram_20161221.pdf>. [Accessed 30 June 2017]

21. "Natural Gas Provides Great Value", online: Enbridge <www.enbridgegas.com/homes/accounts-billing/residential-gas-rates/natural-gas-provides-great-value.aspx>. [Accessed 30 June 2017] Union Gas assumes an average customer consumption of 2,200 m^3/year.

22. Ontario Energy Board, *Natural Gas Conservation Potential Study* by ICF International (Ottawa: updated July 2016) online: <www.oeb.ca/sites/default/files/uploads/ICF_Report_Gas_Conservation_Potential_Study.pdf>.

23. Ibid, at xvi.

24. Directive from the Minister of Energy to the Ontario Energy Board (26 March 2014) online: <www.oeb.ca/oeb/_Documents/Documents/Directive_to_the_OEB_20140326_CDM.pdf>.

Chapter 6

Electricity Conservation Programs

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Abstract

2015 was the first year of the 2015-2020 Conservation First Framework (CFF), which mandates that each Local Distribution Company (LDC) reduce electricity consumption by offering conservation programs to its individual customer segments "as far as is appropriate and reasonable". This was expected to give LDCs more flexibility to align their programs with local needs. In 2015, the province's LDCs achieved 1,117 gigawatt-hours of net energy savings, which represents 16% of their 6-year target. As such, LDCs collectively are on pace to meet their 2020 target. LDCs now only have a target for reducing overall electricity savings, as reducing peak demand is now solely the responsibility of the Independent Electricity System Operator (IESO).

2015 was a transition year between the last and the current conservation frameworks. There was a 5% increase in reported first year incremental energy savings from 2014, which indicates that the transition between frameworks went smoothly. LDCs only spent 1.2% of their $1.8 billion CFF budget, as the rest of the $432 million spent on LDC conservation programs in 2015 came from the remaining funds of the 2011-14 Conservation and Demand Management (CDM) Framework.

Conservation still remains the cheapest form of energy compared to all other forms of electricity supply. The cost of conservation comes in at 3.5 cents/kWh compared to renewable generation (hydro, wind and bio energy) at 6.5-26 ¢/kWh, hydro generation at 12-24 ¢/kWh, nuclear generation at 12-29 ¢/kWh, and 8-31 ¢/kWh for gas generation. Conservation was about 2% of the total electricity system cost in 2015. Conservation will become even more valuable to the electricity system as nuclear refurbishments and (eventually) the Pickering shutdown get underway.

The IESO's Achievable Potential Study concluded that the current funding and programs are sufficient for LDCs to meet (and even surpass) the province's electricity conservation target of 7 terawatt-hours of electricity savings in 2020. The results of this study will feed into the IESO's Mid-Term Review of the CFF, which is required to be completed by June 1, 2018.

6.1 Introduction

2015 was the first year of electricity conservation programs under the 2015-2020 Conservation First Framework (CFF). The CFF requires the Independent Electricity System Operator (IESO) to,

> *...coordinate, support and fund the delivery of CDM {conservation and demand management} programs through the Distributors to achieve a total of 7 TWh reductions in electricity consumption between January 1 2015 and December 21 2020...*[1]

The new framework mandates each local distribution company (LDC) to offer conservation programs that reduce electricity consumption to its individual customer segments "as far as is appropriate and reasonable".

While conservation may also reduce peak electricity demand, there is no longer a peak demand reduction target for LDCs. Reducing peak demand through targeted demand response initiatives is now solely the IESO's responsibility, and demand response (DR) initiatives have been moving to an auction system for authorized participants starting in late 2015. As the ECO has stated in its 2016 *Conservation: Let's Get Serious* Report, peak demand savings are more important than total energy savings in terms of power reliability and affordability.[2] This separation of target responsibility creates a troublesome gap for the province as LDCs will have little incentive in the CFF to focus their energy savings during the peak hours of the day when conservation would displace gas-fired generation or reduce the need for new generation.[3]

The Direction also established that energy savings would be counted on the basis of persistence to the end of the framework (i.e., only conservation measures still delivering savings at the end of 2020 will count towards targets). This is a change from the 2011-2014 framework. The new framework therefore places more importance on conservation programs which have a longer life and result in deeper savings for the province. This makes sense as reducing energy use is less critical in the next few years, given the province's strong short-term supply position. Longer-lasting conservation projects put in place today have more value, as they will help avoid new generation in future years. Because LDCs are now only responsible for overall electricity savings and not specifically peak demand savings (see Table 6.1 for more details), it is generally understood that the 2015-2020 Conservation First Framework electricity savings targets are more aggressive.

In order to support the CFF, the Ontario Energy Board (OEB) amended LDC licenses to add a condition that Conservation and Demand Management (CDM) programs be made available according to local customer characteristics.[4] This was expected to give LDCs more flexibility to align their program offerings to local needs and provide more customer choice while remaining cost-effective in the delivery of their CDM programs.

2015 was also considered as a transition year for the 2011-2014 CDM Framework to allow for CDM programs that were funded but not completed during the four-year framework to be completed in 2015 and be counted towards the results of the new framework.

While conservation may also reduce peak electricity demand, there is no longer a peak demand reduction target for LDCs.

In 2015, the province's LDCs achieved 1,117 GWh of net energy savings, which represents 16% of the six-year CFF target.[5] In other words, LDCs collectively are on track to meet their 2020 target. As shown later, almost 95% of those results can be attributed to CDM programs from the 2011-2014 CDM framework that were completed in 2015. The IESO indicated that the first year results have set a strong foundation for LDCs to achieve the target of 7 TWh of electricity conservation by 2020.[6] The source of the 2015 LDC conservation spending reflects the fact that a significant portion of the 2015 savings came from the previous framework, as analyzed in Section 6.6 of the report.

LDCs collectively are on track to meet their 2020 target.

6.1.1 The Value of Conservation

The province is currently almost halfway through its second full multi-year electricity conservation framework, and conservation still remains the cheapest form of energy. Ontario ratepayers pay more for any form of generation than conservation. The cost of conservation comes in at 3.5 cents/ kWh compared to renewable generation (hydro, wind and bio energy) at 6.5-26 ¢/kWh, hydro generation at 12-24 ¢/kWh, nuclear generation at 12-29 ¢/kWh, and 8-31 ¢/kWh for gas generation. In 2015, a total of $429 million was recovered from Ontario's ratepayers through the Global Adjustment Mechanism (GAM) on electricity bills to fund conservation programs. This represents about 4.3% of the total GAM charged on electricity bills in 2015 and about 2% of the total electricity cost for the province. These percentages are in line with previous years as conservation remains a small fraction of the electricity bill for Ontario's ratepayers. Conservation will only increase in value as the province's nuclear refurbishments and Pickering shutdown get underway.

6.2 Comparing the Frameworks

As mentioned earlier, one of the major differences between the 2011-2014 CDM Framework and the 2015-2020 Conservation First Framework is that the current framework requires LDCs to achieve energy savings only, while the previous one included both energy savings and peak demand targets. Some of the major differences between the two frameworks are highlighted in Table 6.1.

Table 6.1. Comparing the 2011-2014 CDM Framework and the 2015-2020 Conservation First Framework

Key framework elements	2011-2014 CDM Framework	2015-2020 CFF
Duration	4 years plus 1 transition year (2015) to next framework	6 years (2015 is a transition year between the two frameworks)
Oversight	OPA and OEB	IESO
Energy Savings Target	6000 GWh of cumulative energy savings	7000 GWh (7 TWh) of persistent savings in 2020
Peak Demand Target	1330 MW reduction in 2014	Not an LDC target anymore
Energy savings calculation	**Cumulative Savings:*** sum of savings delivered in each year (2011-2014), from measures installed between 2011-2014 (rewards conservation activity in early years, which will deliver more years of savings that count towards target)	**Persistent Savings:** savings occurring in 2020, from measures installed at any time between 2015 and 2020.
Budget	$1.4 billion for LDCs + $0.2 billion for OPA central services[8]	$1.8 billion for LDCs + $0.4 billion for IESO central services[9]
Funding to LDCs	LDCs provided with separate Program Administration Budget and Participant Incentive funding. Participant Incentives were paid after LDC had paid the customer and invoiced the OPA[10]	LDCs have one budget for six years and can allocate funding between program portfolios as needed as long as LDCs remain cost-effective[11]
CDM License Requirement	Performance Requirement: LDCs are required to "achieve reductions in electricity consumption and reductions in peak provincial demand through the delivery of CDM Programs…"[12]	Activity Requirement: The LDC shall "make CDM programs available to customers in its licensed service area and shall, as far as is appropriate and reasonable having regard to the composition of the Distributor's customer base, do so in relation to each customer segment in its service area"[13]
Target Allocation	LDC targets based on division of provincial target, according to LDC's portion of provincial energy consumption and peak demand	Energy target based on achievable potential for each region and LDC territory[14]
Program Composition	LDCs required to deliver Save On Energy province-wide programs. While there were opportunities to get a local program approved by the OEB, the regulator's "duplication test" and approvals process proved to be too onerous for any successful applications except one local program	LDCs can offer a mix of provincial, regional and local programs, including joint programs with gas companies. Programs are approved by the IESO and the "duplication test" rules have been amended to encourage collaboration and local/regional program applications
LDC Incentives	Eligible for a performance incentive at 80% or over of each target. Also eligible for a cost-effectiveness incentive if LDC does not use full administration budget	LDCs are eligible for a Mid-Term Incentive (MTI), an Achieving Target Incentive (ATI) and an Exceeding Target Incentive (ETI), all of which increase if the LDC is part of a joint plan with other LDCs. Also eligible for a Cost-Efficiency Incentive. Alternatively, LDC can also opt for a pay-for-performance model.[15]
LDC Underperformance	LDCs that did not meet 80% of their energy savings targets were at risk of "disciplinary action", although no formal action was taken against LDCs who underperformed[16]	IESO will track performance annually and take remedial steps of various degrees to help improve the LDC's situation. If performance and cost-effectiveness falls below a certain threshold, the LDC will face financial remedies[17]
Mid-Term Review	None	IESO has to complete a Mid-Term Review by June 1, 2018

*Note: The definition of "**cumulative savings**" used for electricity conservation is different than that used for natural gas conservation in Chapter 6. For more information on how "cumulative savings" are defined in gas conservation, see Section 5.1.3.

Source: 2011-2014 OPA-LDC CDM Master Agreement; 2015-2020 IESO-LDC Energy Conservation Agreement (2014), various Directives and Directions from the Ontario Minister of Energy to the IESO, OPA and OEB between 2010 and 2016.

6.3 2015 Program Results

6.3.1 Understanding the Numbers: Legacy Programs vs. Conservation First Programs

2015 was a unique year for the province's LDCs in terms of delivering CDM programs and achieving results. Given that there were CDM projects from the 2011-2014 CDM framework that were in the project pipeline but would not be completed by December 31, 2014, the Minister of Energy issued a Direction to the IESO in 2012 to extend the 2011-2014 framework for one year to December 31, 2015 and to provide the necessary funding for those projects to be completed. This allowed LDCs to engage customers for more long-term CDM projects as it assured customers of the continuity of programs and corresponding incentives past the original framework completion date of December 31, 2014.

Under the new 2015-2020 Conservation First Framework, LDCs had until May 1 of 2015 to file their CDM plans, which details the programs the LDCs will be delivering to their customers to achieve their individual targets, to the IESO for review and approval. The framework also gave LDCs the option to launch the CFF framework on any date on or prior to January 1, 2016. From a customer point of view, the IESO indicated that participants hardly saw any differences in program availability or how the programs were delivered. Some programs such as the Fridge & Freezer Pickup Program were discontinued on January 1, 2016, but that news had already been communicated to the market, independent of the CFF. Given the strong results of 2015 (see Section 6.3.2 below), it can be deduced that customers did not experience any issues with different LDCs working on different timelines to transition to the new framework.

As a result of this "bridge" between frameworks, 2015 turned out to be a transition year for the province in terms of conservation frameworks as the 2011-2014 CDM Framework wrapped up, with two-thirds of LDCs deciding to launch the Conservation First Framework on January 1, 2016 and therefore delivering only legacy programs from the 2011-2014 framework throughout 2015.[19] The budget for the 2015 legacy programs came from the 2011-2014 CDM framework's funds.[20] The 2015 energy savings from the legacy programs, however, were attributed to the 2015-2020 Conservation First Framework targets which undoubtedly will help LDCs with their target achievement by the end of the framework.

> The results from 2015 are the strongest for the province to date.

6.3.2 First Year of Conservation First Framework: How Did the Province Do?

Net verified energy savings persisting to 2020 from 2015 program activity was 1,117 GWh, which represents 16% of the 7 TWh target under the Conservation First Framework. The results from 2015 are the strongest for the province to date, as can be seen from Figure 6.1. Incremental first year results were 5% higher than in 2014 (the last year of the 2011-2014 results), which indicates that the transition between frameworks went smoothly and the province's progress in conservation remains positive. Another reason for the strong performance was that projects that were started in 2014 under the 2011-2014 framework but were completed in 2015 were counted towards the LDC's 2015-2020 CFF target, which undoubtedly bolstered the savings numbers. It will be important to track how LDCs perform in the next years of the framework when there are no carry-over projects from a previous framework to add to the savings numbers.

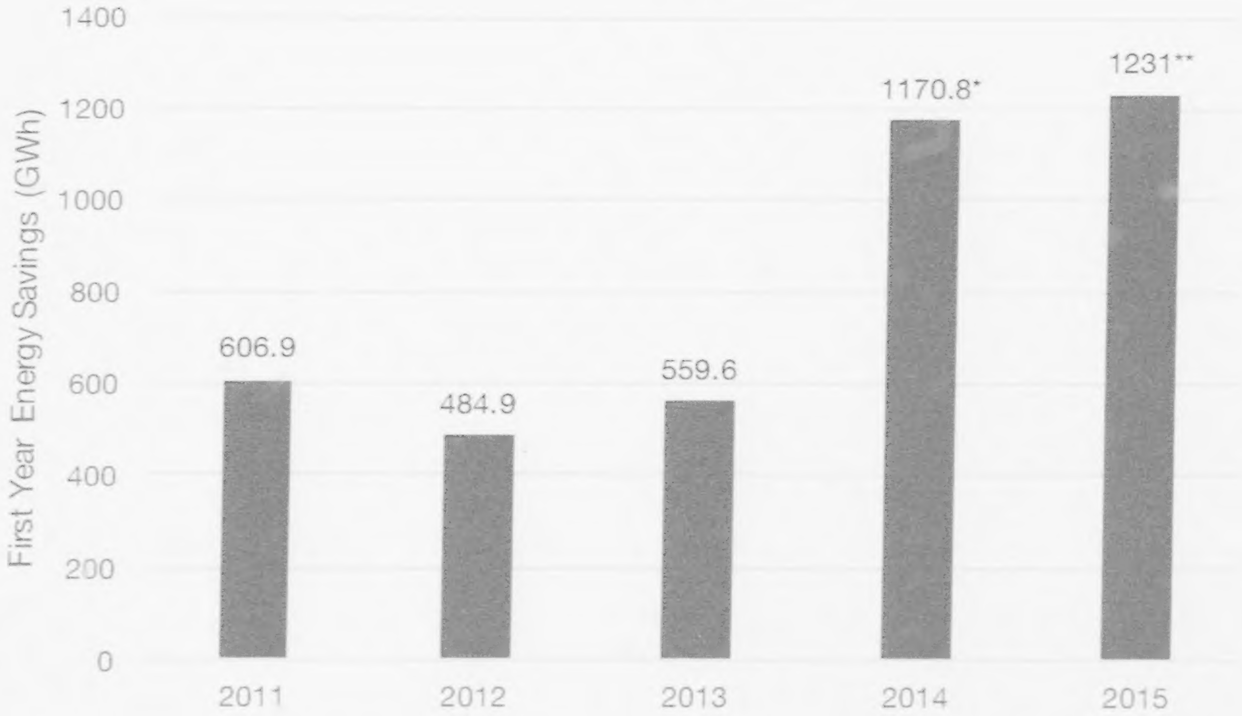

Figure 6.1. First year energy savings from new conservation program activity for distribution-connected customers

*Note: the 2014 incremental first year savings numbers have been updated from the ECO's 2015 *Conservation: Let's Get Serious* report based on IESO true-ups.

**Note: For an equivalent comparison with other years, the 2015 results are the incremental first year energy savings. Of the 1231 GWh saved in 2015, only 1117 GWh will persist into 2020 and therefore will be counted towards the final 7 TWh target.

Source: ECO, Conservation: *Let's Get Serious, 2015 Annual Conservation Progress Report* at 176 (2016); IESO, *2015 Annual Verified Local Distribution Company Conservation and Demand Management Program Results Report* (2016) at 11.

Almost 94% of the results (1,048 out of 1,117 GWh) were attributable to the 2011-2014 legacy programs as a majority of LDCs chose to start the new framework on January 1, 2016.[21] For LDCs that did transition to the CFF framework in 2015, the savings came from those initiatives that had been successful in terms of participation and savings in the last framework, such as the Coupon Program and the Retrofit Program. A more detailed breakdown of how the different suites of programs and individual programs performed is in Section 6.4 of the report.

6.3.3 2016 Electricity Conservation Results

The final verified 2016 results were released by the IESO on June 30, 2017. The ECO has not had the opportunity to analyze the assumptions behind this report and plans to do so in its next conservation report. The IESO reported that in 2016, LDCs achieved 1,033 GWh of incremental energy savings that will persist to 2020. The 2015 results have also been updated from 1,117 GWh to 1,480 GWh of persistent savings to 2020. This increase in savings numbers can be attributed to true-ups completed to account for savings that were reported late by the LDCs during the 2015 reporting period. Table 6.4 of this chapter also lists several Behind-the-Meter Generation (BMG) projects that were not counted in the 2015 report and therefore would have been included in this true up. Therefore, the IESO has adjusted its 2015 results accordingly.

When combined with the verified 2015 results and verified 2015 adjustments, the LDCs have achieved 2.5 TWh in the first two years of the 2015-2020 CFF, or approximately 36% of the province's 7 TWh target.[22] The IESO has indicated that the LDCs continue to show progress towards achieving the CFF target by the end of the framework. Total CDM expenditure in 2016 was $206 million. Together with the spending of 2015, LDCs have collectively spent $231 million or 13% of their $1.8 billion budget.[23]

6.3.4 Defining the Different Types of Electricity Conservation Programs in Ontario

Province-wide CFF programs: CDM programs that have been developed by the IESO and the LDCs and available across the province currently under the Conservation First Framework (CFF).

Legacy programs: Province-wide programs that were part of the 2011-2014 CDM Framework and the 2015 extension and were delivered or completed in 2015 as LDCs transitioned between the two frameworks.

IESO-only CDM programs: CDM programs administered directly by the IESO for large transmission-connected customers, and demand response programs for distribution- and transmission-connected customers that are designed to deliver peak demand reduction, not energy savings. Results from IESO-only programs do not contribute to LDC targets.

Regional/local CDM programs: CDM programs developed by one LDC (local) or a group of LDCs in one region (regional) that are approved by the IESO and delivered by those LDC(s) alongside the province-wide programs.

LDC Innovation Fund Pilots: Small-scale launch of a local/regional CDM program by an LDC to test the delivery mechanisms and savings realizations of an innovative initiative. These programs, approved by the IESO, are funded outside the CDM Plan funding through a dedicated LDC Innovation Fund to minimize budgetary risks for the LDC.

Conservation Fund Pilots: Innovative conservation technologies that have the potential to deliver significant energy savings have been funded by the IESO's Conservation Fund since 2005. Recipients of the Conservation Fund can be LDCs, technology companies, consultations, educational institutions etc. Unlike LDC Innovation Fund Pilots, the goal of a Conservation Fund project is not always to test an initiative with the intent of transitioning it to a full-scale LDC program.

6.4 Individual Program Results by Sector

The 2015 results by initiative and individual program contributions to the total energy savings achieved are presented in Table 6.2, along with the number of measures/projects completed for each initiative.[24] For comparison purposes, the savings from the initiatives are divided between the 2011-2014 legacy programs delivered in 2015 and programs that are from the 2015-2020 Conservation First Framework. The table also presents the net energy savings from 2014, the last year of the CDM Framework, to track how programs have transitioned between frameworks.

Table 6.2. 2015 Conservation Results by Program for Distribution Connected Customers

Initiatives	Incremental Energy Savings (Net) (GWh)			**Incremental Demand Reduction (MW)**			Participation		
	2014	2015		2014	2015		2014	2015	
		From 2011-2014 Legacy Programs*	From CFF programs		From 2011-2014 Legacy Programs*	From CFF programs		From 2011-2014 Legacy Programs*	From CFF programs
Residential									
Appliance Retirement	9.5	0	0	1.61	1.03		22,563 appliances	14,733 appliances	0
Appliance Exchange	2.1	-	-	-	-	-	5,685 appliances	-	-
Bi-Annual Retailer Event	122.9	73.0	0		5		48,24751 measures	31,78024 measures	0
Coupon Program (Save On Energy)	32.8	49.8	31	2.4	3.3	2.02	1,208,108 measures	2,075,200 measures	1,207,533 measures
HVAC Incentives (Save on Energy)	42.9	45.97	10	23.1	24	5.3	113,002 equipment	102,154 equipment	20,235 equipment
Residential New Construction	2.3	6.3		0.37	1.1		2,367 homes	4,012 homes	0
All Residential Initiatives	**210.4**	**175.1**	**41**	**27.48**	**34.5**				
Business									
Energy Audit (Save On Energy Audit Funding Program)	30.9	-	-	6.3	5.6	0	473 audits	356 audits	2 audits
Efficiency: ERII (Save on Energy Retrofit Program)	462.9	648.3	19	70.7	94	2.8	10,925 projects	12,547 projects	611 projects
Direct Install Lighting	84.5	32.3		23.4	11.9		23,784 projects	18,643 projects	0
New Construction	20.4	21.8		6.4	5.2		226 buildings	166 buildings	0
Existing Building Commissioning	1.5	-		0.99	0.4		5 buildings	11 buildings	0
All Business Initiatives	**600.2**	**702**	**19**	**107.79**	**117.1**				

Initiatives	Incremental Energy Savings (Net) (GWh)			**Incremental Demand Reduction (MW)			Participation		
	2014	2015		2014	2015		2014	2015	
		From 2011-2014 Legacy Programs*	From CFF programs		From 2011-2014 Legacy Programs*	From CFF programs		From 2011-2014 Legacy Programs*	From CFF programs
Industrial									
PSU- Project Incentive Initiative	72.1	122.7		9.7	13.6		10 projects	12 projects	
PSU- Energy Manager	40.4	25.18		5.2	7.6		379 projects	424 projects	
PSU- Monitoring and Targeting	0.5	-		0.1	-		5 projects	2 audits	
All Industrial Initiatives	**113**	**148**		**15**	**21**				
Other									
Low Income Program (Save on Energy Home Assistance Program)	19.58	11.75	0.975	2.5	2.2	0.21	25,424 homes	15,494 homes	1032 homes
Aboriginal Programs	3.1	3.24		0.8	0.6		1,125 homes	1,586 homes	
Program Enabled Savings		7.27			1.1			14 projects	
Adjustments to previous years' results	195.2	-	-	-					
Other Programs Total (TOU savings+LDC pilots)	24.1			1.2			1,217 projects		
Pre-2011 Programs Total	3.2	-	-	49.4	-	-	8 projects		
Sub-total for 2015 by Framework		**1,047.67**	**61.51**		**176.6**	**10.4**			
Total	**1170.8**	**1,117.5**		**176.63**	**187**				

*Note: 2011-2014 CDM framework programs that were delivered in 2015 and counted towards 2015 results)

**Note: Even though demand reduction is not an LDC target anymore in the CFF, incremental demand reduction, which calculates new demand reductions from new measures installed, is presented here to compare with the 2014 results.

Source: IESO, *2015 Annual Verified Local Distribution Company Conservation and Demand Management Program Results Report* (2016) at 9-11.

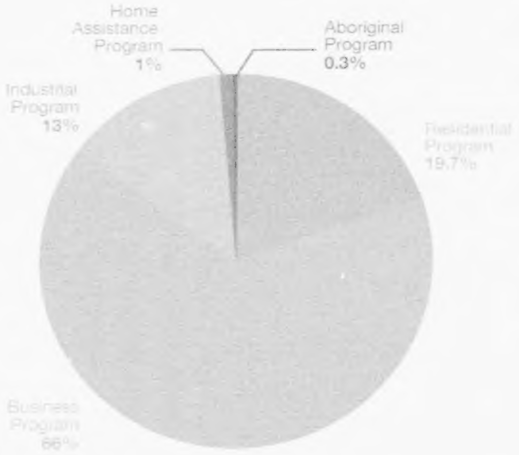

Figure 6.2. Percentage contributions of programs to 2015 energy savings

Source: IESO. *2015 Annual Verified Local Distribution Company Conservation and Demand Management Program Results Report* (2016) at 17.

Figure 6.2 also illustrates the percentage contribution of each program portfolio to the energy savings achieved in 2015.

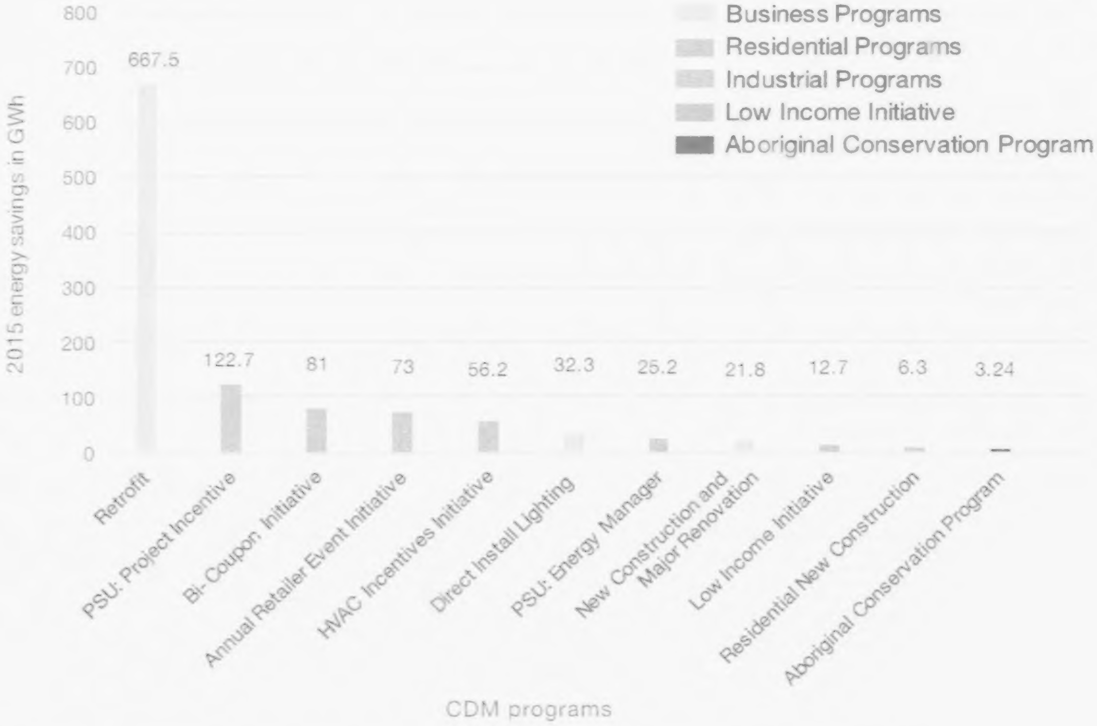

Figure 6.3 Persistent Energy Savings from leading conservation initiatives under the 2015-2020 Conservation Framework

Source: IESO. *2015 Annual Verified Local Distribution Company Conservation and Demand Management Program Results Report* (2016) at 13. IESO information provided to the ECO in response to ECO inquiry (21 March 2017).

6.4.1 Residential Programs

The Residential Programs saw a strong year of program delivery in 2015, with the legacy programs delivering 80% of the Residential Program savings. The Coupon Program resulted in the largest amount of savings (154 GWh) in the residential portfolio and was mainly due to the widespread redemption of LED coupons.[25] The HVAC Program also saw a 10% increase in participation from 2014. Figure 6.3 indicates that the Coupon Initiative and the Retailer Event Initiative were the highest performers in the residential sector in 2015. Building on the success of the Coupon Program, the CDM Residential Working Group and the IESO have made several changes to the program, including offering higher incentives on certain lighting coupons and on clotheslines as well.[26] As of Fall 2017, the Coupon Program will be transformed into the Instant Discount Program and offered biannually.[27]

It is important to point out that 2015 was the last year for any new peaksaver PLUS installations since peak demand reductions are no longer the responsibility of the LDCs under the 2015-2020 CFF. The ECO had noted in our 2016 *Conservation: Let's Get Serious* report (which reviewed the 2014 results) that the peaksaver PLUS program had seen strong growth with over 300,000 installations across the province by the end of 2011-2014 framework.[28] The IESO has received Ministerial Direction to transition these devices, which are used to temporarily curtail air-conditioning fan cycles and pool pumps to reduce electricity use during high peak hours in the summer, to its capacity based demand response programs.[29] A detailed update on the peaksaver PLUS program is available in Text Box 6.8.3.

6.4.2 Business Programs

The Save On Energy Business Programs remained the strongest performer of all the portfolios in terms of energy savings, as it has in previous years. It contributed close to 65% of the energy savings persisting to 2020 achieved in 2015. The Retrofit Program led the way in terms of energy savings, contributing close to 90% of the savings for the Business Programs and also increasing by 41% from 2014. Net energy savings for individual projects ranged from 2 kWh to over 6.2 GWh.[30] The IESO attributes the increase in energy savings to a higher number of projects (from 10,925 projects in 2014 to 13,358 projects in 2015) and to an increase in average project savings, which went up by 26% from 2014.[31] Figure 6.3 shows the savings contribution of the individual business programs, with the Retrofit Program leading the way. To further the continued success of the Retrofit Program, the Business Working Group and the IESO worked together to make several changes to the program in 2016. The changes include a streamlined approvals process for projects under a certain incentive level; clarifying the eligibility for a custom track application; creation of a multi-site application model; and introducing more prescriptive measures to meet customer demand.[32]

2015 was the last year for any new peaksaver PLUS installations since peak demand reductions are no longer the responsibility of the LDCs under the 2015-2020 CFF.

On the other hand, the Small Business Lighting Program saw a 22% drop in the number of projects and a 40% drop in energy savings in 2015.[33] The IESO attributes this decrease to the program reaching a saturation point in the small business sector with LEDs becoming standard installations, a concern that has been expressed by LDCs in the past years and recognized by the ECO's previous reports.[34] The average savings per project also decreased because only 60% of the energy savings will persist to 2020 due to baseline shifts.[35] The change in baseline is due to the upcoming changes in Canada's energy regulations and Canada's lighting market which will mean that a number of measures in the lighting initiative would have occurred anyway within the measure's expected useful life, even without the influence of the program. Therefore, the program does not receive full credit for the energy and demand savings achieved over the measure's lifetime.[36]

The Small Business Lighting Program was completely redesigned by the IESO and the Business Working Group in 2015 and launched in early 2016 and amended to encourage more participation for the rest of the framework. Those changes include focusing on LED measure incentives, expanding the facility eligibility size from 50 kW to 100 kW of average demand and the maximum incentive that a customer can receive has also increased from $1,500 to $2,000.[37]

6.4.3 Industrial Programs

The Industrial Programs also performed better in 2015 than in 2014, with both the Project Incentive Initiative and the Energy Manager Initiative under Process and Systems Upgrade (PSU) experiencing an increase in savings from 2014, as shown in Table 6.2. However, these initiatives are multi-year initiatives and the increase in numbers could be attributed to the completion of projects that started earlier in the framework and not because of new customers signing up to participate in the initiatives. Of the 12 Project Incentive Initiatives completed in 2015, four of them were Behind-The-Meter Generation (BMG) projects that accounted for 73% of the program's savings. Table 6.3 lists the BMG projects completed in 2015.

Table 6.3. Behind-the-Meter Generation Projects Completed in 2015

LDC	Participant	Fuel Source*	Contracted Savings MWh/Yr	EM&V Results MWh/Yr
Entegrus Powerlines (Chatham-Kent Hydro)	GreenField Ethanol Inc.	Natural Gas	25,630	28,291
Guelph Hydro Electric System Inc.	Magna	Natural Gas	50,760	42,148
Hydro One Networks Inc.	Erie Meats	Natural Gas	8,410	0
Hydro One Networks Inc.	Terra International Inc.	Natural Gas	22,355	16,649
Total			**107,155**	**87,088**

*Note: Behind-the-Meter Generation projects usually involve facilities using natural gas to generate electricity for their own use. More information is available in Text Box 6.4.4.

Source: IESO information provided to the ECO (21 March 2017).

There were also several BMG projects that were completed in 2015 but did not get included in the 2015 results because of delays in measurement and reporting. Table 6.4 lists those BMG projects, the results of which will be counted in the 2016 Evaluation, Measurement & Verification (EM&V) process.

Table 6.4. Behind-the-Meter Projects Completed in 2015 but Not Included in 2015 Savings Results

LDC	Participant	Fuel Source	Contracted Savings MWh/Yr
Oshawa PUC Networks Inc.	Lakeridge Health	Natural Gas	12,880
Cambridge and North Dumfries Hydro Inc.	Toyota Motors Manufacturing Canada Inc.	Natural Gas	72,510
North Bay Hydro Distribution Limited	North Bay RHC	Natural Gas	12,900
Toronto Hydro	Campbells	Natural Gas	25,730
Hydro One Networks Inc.	Invista	Natural Gas	35,760
Thunder Bay Hydro	TBRHSC	Natural Gas	16,191
Hydro One Networks Inc.	3M Canada	Natural Gas	13,840
Total			**189,811**

Source: IESO information provided to the ECO (21 March 2017).

6.4.4 Is Combined Heat and Power a Form of Conservation?

Combined heat and power (CHP) or cogeneration refers to the concurrent production of electricity or mechanical power and useful thermal energy from a single source. In CHP, the heat that would normally be wasted in generating thermal electricity[39] is recovered to provide useful heat or cooling, usually as hot water or steam. Since the water will cool down as it travels from the generation plant, CHP often works best if the thermal energy can be used on site, or close by.

Because the same unit of fuel (usually natural gas) is used to produce both heat and electricity at the same time, CHP is almost always more efficient than burning gas separately to generate electricity and to provide heat. From the electricity grid operator's point of view, on-site power generation behaves similarly to conservation, as the facility the CHP unit is part of generates and consumes its own electricity, reducing load on the grid.

There are other benefits to facilities and communities that install CHP units. CHP plants increases power reliability and can provide backup power during power failures. Several communities are now considering CHP as part of their community energy hubs.[40] At least one CHP project under development in northern Ontario is part of an energy hub, integrated with renewable generation such as solar panels and battery storage.

For these reasons, in the Conservation First Framework and the Industrial Accelerator Program (IAP), CHP behind-the-meter generation (BMG) projects (under 10 MW) are considered as CDM activities.[41] BMG CHPs are currently eligible to receive funding and incentives under the Process and Systems Upgrade Program as part of the Industrial Programs under CFF and the IAP. BMG CHP projects are integral to LDCs' CDM plans and their ability to meet their electricity conservation targets (73% of electricity savings of the industrial programs in 2015 came from BMG CHP projects, see Section 6.4.3 for more details). CHP projects are a significant portion of many LDCs' six year targets, e.g., one medium-sized LDC has already achieved close to 70% of their overall target in 2015 because a CHP project from the previous framework came into service in 2015.

The Climate Change Action Plan has raised uncertainty about the future treatment of CHP, given that CHP projects are fossil-fuel based. CHP does not receive any special recognition or encouragement under the Action Plan, despite some of the benefits mentioned earlier. LDCs have advised that many large customers are hesitant to consider installing BMG CHP in their facility as it is not clear whether CHP projects will still be eligible to receive a CDM incentive from utility conservation programs upon project completion. Given the length of time, the upfront cost of the study and the manpower required to undertake the engineering study before moving forward with the CHP installation, customers remain reluctant to invest in such a project. In the same example mentioned earlier in this section, uncertainty around funding and the complicated engineering study took up almost all of the duration of the 2011-2014 CDM Framework before the CHP came into service in 2015. The Ministry of Energy and the IESO's lack of direction in this matter has left customers and LDCs in limbo.

The actual impact of CHP on Ontario greenhouse gas emissions is variable. In jurisdictions where most electricity is generated by burning fossil fuels, CHP always displaces fossil-fuelled generation and therefore reduces GHG emissions. In Ontario, CHP would currently be displacing low-emission generation (nuclear or renewables) much of the time. This could change during the upcoming nuclear refurbishments, or if growing demand is met by more gas-fired electricity generation. More work is needed by the Ministry of Energy and the IESO to assess the impact of CHP on the province's overall emissions, in light of Ontario's existing electricity supply and its projected supply mix in the future.

6.4.5 Home Assistance Program and Aboriginal Program

The Save On Energy Home Assistance Program (the province's low income CDM program) saw a 35% drop in participation. This may be attributed to the amendment in the CDM requirement in LDC licenses between the 2011-2014 framework and the 2015-2020 Conservation First Framework. As mentioned earlier, the new CDM requirement mandates LDCs to deliver conservation programs in its territory "in relation to each customer segment in its service area", as well as within each LDC's budget constraints. This may mean that some LDCs did not include the Home Assistance Program in their CDM plans as one of the programs that they intended to deliver given the customer segmentation in its jurisdiction. However, results for the Home Assistance Program are expected to change in the coming years given the Minister's December 2016 Direction, which is discussed in Section 6.11.1 of this report.

The Aboriginal Program that was delivered by the IESO ended on December 31, 2015, but Hydro One is currently offering a First Nations Conservation Program that has already had over 3,400 eligible homes participate in the program.[42] Savings results from that program will be analyzed by the ECO in its next annual energy conservation report when it reviews the 2016 results.

Some LDCs did not include the Home Assistance Program in their CDM plans.

6.5 Individual LDC Performance

Table 6.5 outlines the performance of LDCs in the first year of the 2015-2020 CFF. As with the aggregate provincial results, savings from both legacy program activity and new CFF programs are included. In terms of their progress towards meeting their individual 2020 energy savings targets, the LDCs as a whole achieved 16% of their 7 TWh 2020 target. One medium-sized LDC has managed to achieve close to 70% of its 2020 target in the first year of the framework, and several others are close to the halfway mark of their targets. Several medium and small LDCs have only managed single digit progress on their targets.

According to the IESO, the LDCs that performed exceptionally well experienced far greater savings than they had projected due to a ramp up of activity prior to the end of the 2011-2014 framework. Other factors that contributed to higher than expected savings were

- strong uptake of the Coupon Program;
- large BMG CHP projects being completed in 2015 (see Section 6.4.3 on program results); and,[43]
- Some LDCs decided not to update their CDM plans after the original submission on May 1, 2015, meaning that their planned CDM forecasts were not an accurate reflection of expected program activity.[44]

For LDCs that did not fare well in 2015, the IESO will continue to monitor LDC performance on a monthly basis and has several remedial tools available in the Energy Conservation Agreement to help the LDC improve its performance.

Table 6.5. Individual LDC Performance in 2015 under the 2015-2020 Conservation First Framework

#	LDC	Net Verified 2020 Annual Energy Savings (kWh)	Allocated 2015- 2020 CFF LDC CDM Plan Target (kWh)	Progress Towards Allocated 2015- 2020 CFF LDC CDM Plan Target (%) (17% ≈ on pace to meet target)
1	Algoma Power Inc.	1,031,011	7,510,000	14
2	Atikokan Hydro Inc.	109,769	1,140,000	10
3	Attawapiskat Power Corporation	35,822	510,000	7
4	Bluewater Power Distribution Corporation	7,755,327	62,370,000	12
5	Brant County Power Inc.	1,810,109	15,950,000	11
6	Brantford Power Inc.	7,457,011	54,320,000	14
7	Burlington Hydro Inc.	12,632,309	99,040,000	13
8	Cambridge and North Dumfries Hydro Inc.	15,435,132	85,000,000	18
9	Canadian Niagara Power Inc.	3,502,396	28,480,000	12
10	Centre Wellington Hydro Ltd.	1,581,029	8,730,000	18
11	Chapleau Public Utilities Corporation	275,333	1,050,000	26
12	COLLUS PowerStream Corp.	1,637,947	16,860,000	10
13	Cooperative Hydro Embrun Inc.	120,443	1,790,000	7
14	E.L.K. Energy Inc.	1,662,553	16,200,000	10
15	Enersource Hydro Mississauga Inc.	59,582,917	483,270,000	12
16	Entegrus Powerlines Inc.	38,558,192	56,830,000	68
17	EnWin Utilities Ltd.	14,809,440	151,300,000	10
18	Erie Thames Powerlines Corporation	5,180,177	27,630,000	19
19	Espanola Regional Hydro Distribution Corporation	502,006	2,410,000	21
20	Essex Powerlines Corporation	3,819,710	31,430,000	12
21	Festival Hydro Inc.	4,822,853	34,650,000	14
22	Fort Albany Power Corporation	29,906	340,000	9
23	Fort Frances Power Corporation	254,688	4,000,000	6
24	Greater Sudbury Hydro Inc.	6,959,582	34,740,000	20
25	Grimsby Power Incorporated	2,804,724	10,850,000	26
26	Guelph Hydro Electric Systems Inc.	58,594,547	99,040,000	59
27	Haldimand County Hydro Inc.	8,342,090	19,850,000	42
28	Halton Hills Hydro Inc.	5,500,566	30,940,000	18
29	Hearst Power Distribution Company Limited	1,510,384	3,180,000	47
30	Horizon Utilities Corporation	70,835,688	330,680,000	21
31	Hydro 2000 Inc.	80,683	1,360,000	6
32	Hydro Hawkesbury Inc.	1,162,440	7,920,000	15
33	Hydro One Brampton Networks Inc.	29,578,103	255,160,000	12
34	Hydro One Networks Inc.	200,176,997	1,159,020,000	17
35	Hydro Ottawa Limited	57,247,836	394,540,000	15
36	InnPower Corporation	1,850,172	13,010,000	14
37	Kashechewan Power Corporation	40,200	520,000	8
38	Kenora Hydro Electric Corporation Ltd.	1,606,080	5,270,000	30
39	Kingston Hydro Corporation	4,445,966	34,500,000	13

40	Kitchener-Wilmot Hydro Inc.	21,865,242	105,710,000	21
41	Lakefront Utilities Inc.	2,239,136	12,170,000	18
42	Lakeland Power Distribution Ltd.	4,432,710	15,770,000	28
43	London Hydro Inc.	28,534,591	196,660,000	15
44	Midland Power Utility Corporation	2,860,953	10,830,000	26
45	Milton Hydro Distribution Inc.	9,889,501	45,360,000	22
46	Newmarket-Tay Power Distribution Ltd.	8,218,024	36,240,000	23
47	Niagara Peninsula Energy Inc.	12,742,252	74,440,000	17
48	Niagara-on-the-Lake Hydro Inc.	2,598,018	11,680,000	22
49	Norfolk Power Distribution Inc.	7,655,950	18,850,000	41
50	North Bay Hydro Distribution Limited	4,245,690	20,260,000	21
51	Northern Ontario Wires Inc.	509,731	4,310,000	12
52	Oakville Hydro Electricity Distribution Inc.	21,252,248	92,390,000	23
53	Orangeville Hydro Limited	3,398,117	14,150,000	24
54	Orillia Power Distribution Corporation	1,662,040	16,580,000	10
55	Oshawa PUC Networks Inc.	5,046,074	73,010,000	7
56	Ottawa River Power Corporation	2,779,858	8,720,000	32
57	Peterborough Distribution Incorporated	4,979,980	37,880,000	13
58	PowerStream Inc.	76,511,169	535,440,000	14
59	PUC Distribution Inc.	4,538,096	26,410,000	17
60	Renfrew Hydro Inc.	351,383	4,170,000	8
61	Rideau St. Lawrence Distribution Inc.	1,353,836	5,020,000	27
62	Sioux Lookout Hydro Inc.	537,110	3,700,000	15
63	St. Thomas Energy Inc.	2,146,544	17,510,000	12
64	Thunder Bay Hydro Electricity Distribution Inc.	5,286,985	48,420,000	11
65	Tillsonburg Hydro Inc.	1,886,420	11,310,000	17
66	Toronto Hydro-Electric System Limited	197,146,346	1,576,050,000	13
67	Veridian Connections Inc.	16,332,332	152,970,000	11
68	Wasaga Distribution Inc.	2,385,191	6,320,000	38
69	Waterloo North Hydro Inc.	12,799,897	82,380,000	16
70	Welland Hydro-Electric System Corp.	1,729,306	25,500,000	7
71	Wellington North Power Inc.	709,927	5,890,000	12
72	West Coast Huron Energy Inc.	438,855	8,080,000	5
73	Westario Power Inc.	4,282,957	23,010,000	19
74	Whitby Hydro Electric Corporation	6,210,809	58,440,000	11
75	Woodstock Hydro Services Inc.	4,312,063	22,970,000	19
Total		**1,117,489,826**	**7,000,000,000**	**16**

Source: IESO, *2015 Annual Verified Local Distribution Company Conservation and Demand Management Program Results Report* (2016) at 18

6.6 Electricity Conservation Spending in 2015

Given that most of the energy savings for 2015 came from the 2011-2014 legacy programs that were delivered or completed in 2015, it is not surprising that the majority of the year's spending also came from the 2011-2014 budget. In total, the province spent $432 million in the delivery of LDC CDM programs, of which only $25.5 million was from the CFF ($22.5 million from the LDC CDM plan budgets and about $3 million from the IESO's Central Services Budget). The rest of the spending for 2015 came from the 2011-2014 CDM framework budget and spending on the Conservation Fund. An additional $74 million was spent on IESO-only programs, for a total of $506 million on conservation programs.

Of the $1.8 billion budgeted under the CFF CDM Plans over the 2015-2020 period for LDCs, only 1.2% of that funding was used in 2015. The OEB notes that this has put the province's LDCs in an advantageous position of having a larger than anticipated budget available over the remainder of the term to use towards achieving their conservation targets.[45] The bulk of the spending in 2015 from the legacy program budget went to the Business and Residential Programs, which is broken down in Figure 6.4.

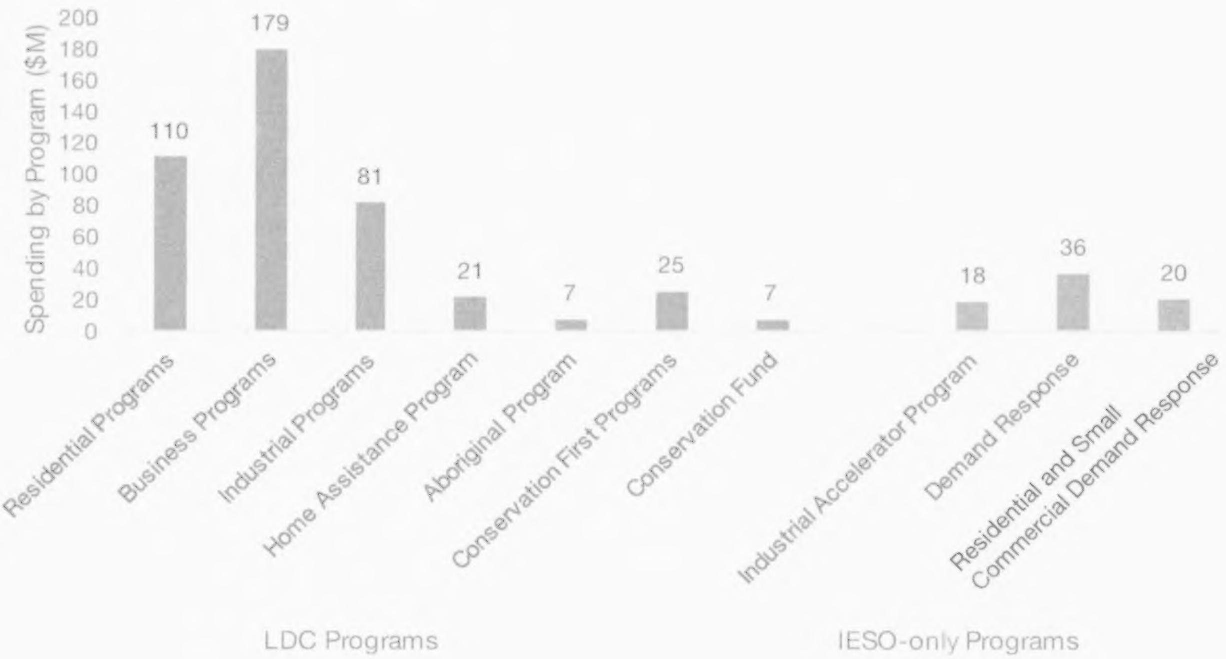

Figure 6.4. 2015 Ontario electricity conservation spending by program portfolio.

Note: Since Conservation First Framework expenditure only represented 5% of the total spending in 2015, spending from the framework's budget is shown as a program category in the chart (based on the information received from the IESO). The ECO will be providing more in-depth analysis of CFF spending in subsequent years.

While the total conservation costs reported by the IESO was $506 million, a total of $429 million was recovered from Ontario's ratepayers through the Global Adjustment Mechanism (GAM). The reason for the variance was because of budget reconciliations from the 2011-2014 CDM framework, changes in reporting methodology between frameworks, pre-funding provided to LDCs under the CFF and differences in reporting timelines.[46] The $429 million represents about 4.3% of the total GAM charged on electricity bills in 2015 and about 2% of the total electricity cost for the province.[47] These percentages are in line with previous years. Conservation still amounts to a very small part of the electricity bill for Ontario's ratepayers.

Spending by type of expense for LDC CDM programs is shown in Figure 6.5. As has been the trend in previous years, close to three-quarters of the expenses went towards customer incentives. The rest of the expenses went towards the IESO and the LDCs' respective administrative expenses. Under the CFF, the IESO remains responsible for Central Services such as program evaluation, tracking of results, province-wide marketing, technical review of programs, market research, etc. Value-Added Services, which are centralized program delivery services towards specific initiatives, such as the administration of the Coupon Program, are charged against LDCs' CDM Plan Budgets on a participation basis. Either the IESO or the LDCs may be responsible for technical assistance, customer support, and other program delivery functions (this varies depending on the specific conservation program), and both groups have a role in program design.

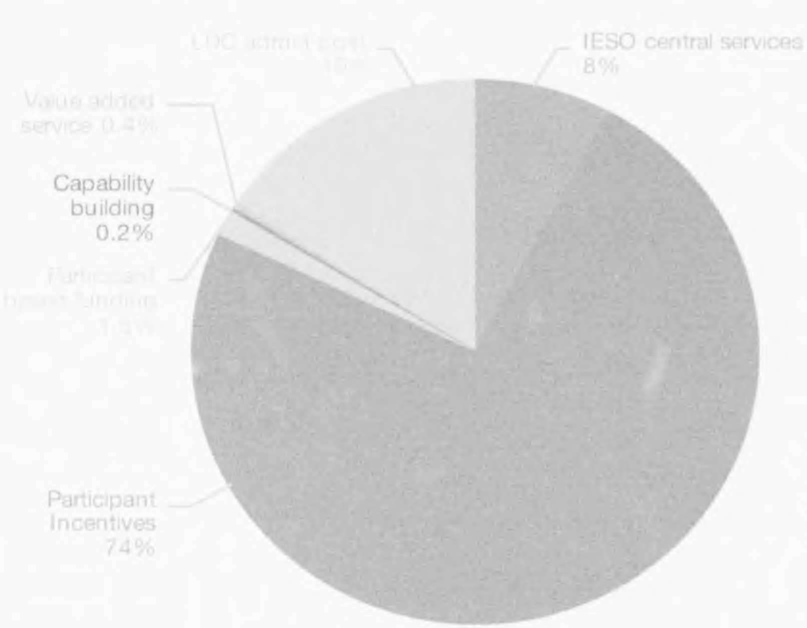

Figure 6.5. 2015 Ontario electricity conservation spending by type of expense.

Source: IESO information provided to the ECO.

There were no local or regional LDC CDM programs in market in 2015 and therefore the results and spending numbers above do not include energy savings or spending on those programs.[48] The IESO approved five local programs in 2015 but those were launched in 2016, so their spending and results can be expected from the IESO's 2016 results report later this year. More information on local programs and pilots under the CFF is in Section 6.9 of this report.

6.7 Cost-Effectiveness in 2015

The cost-effectiveness of programs in 2015 is shown in Table 6.6. The cost-effectiveness of CDM programs for 2011-2014 framework has also been presented for comparison purposes. As has been done in previous years, two cost-effectiveness tests are used which compare lifetime costs and benefits, but from different perspectives. The Program Administrator Cost (PAC) reviews the costs and benefits from the view point of the program administrator while the Total Resource Cost (TRC) looks at the costs and benefits that accrue society, including additional costs paid by customers, and non-energy benefits.

A ratio of greater than 1 for both those tests generally indicates that the benefits outweigh the costs and therefore the conservation program has been beneficial for the province. In the CFF, the LDC's whole portfolio of programs in each year of its CDM plan had to be greater than 1 for the IESO to approve the plan, with the caveat that if the proposed plan had a ratio of less than 1.3 then it would be subject to further review before approval.[49] Another change from the last framework is that the TRC now includes a 15% adder for non-energy benefits of conservation (including greenhouse gas emissions reductions) which will improve the benefit to cost ratios.[50] The modified test is known as the "TRC-plus" test and 2015 is the first year in which the adder is being used in cost-effectiveness reporting. The same adder is being used in the cost-effectiveness calculation for gas conservation programs (see Section 5.1.6).

Table 6.6. Cost Effectiveness: 2015 Program Activity vs. 2011-2014 Program Activity

Program	Total Resource Cost Test (Benefit: Cost Ratio)		Program Administrator Cost Test (Benefit: Cost Ratio)		Levelized Cost of Delivery (c/kWh)	
	2015	2011-14	2015	2011-14	2015	2011-14
Consumer	3.59	1.3	2.2	1.6	3.63	4.8
Business	1.05	1.3	2.28	2.8	2.9	3.1
Industrial	0.82	0.9	1.23	1.3	5.2	4
Home Assistance	1.01	0.6	0.88	0.6	8.9	11.4
Aboriginal	0.86	1.1	0.75	1.1	10.5	7.7
TOTAL (Distribution-Connected Programs)	**1.29**	**1.2**	**1.99**	**2.2**	**3.5**	**3.6**
IESO only Demand Response		1.6		1.1	Not applicable	
IESO only Industrial Accelerator	0.8	0.6	1.26	0.5	4.7	11.2
TOTAL (Distribution- and Transmission-Connected Programs)	**1.27**	**1.2**	**1.96**	**2.1**	**3.54**	**3.7**

Source: IESO information provided to the ECO.

The cost-effectiveness numbers for the first year of the Conservation First Framework were positive.

The cost-effectiveness numbers for the first year of the Conservation First Framework were positive for both the TRC and the PAC . When the cost-effectiveness of programs in 2015 (which are a mix of legacy and CFF programs) is compared against the average cost-effectiveness of programs during 2011-2014, it is noticed that the TRC number has improved slightly in 2015 (1.27 in 2015 vs. 1.2 in 2011-2014), while the PAC number has seen a slight drop (1.9 in 2015 and 2.2 for the 2011-2014 average). The TRC number has improved slightly given the Ministerial Direction in December 2014 to add a 15% adder to the TRC calculation to account for non-energy environmental benefits, as mentioned earlier. While the overall numbers have very small changes between the average of the last framework and the first year of the new one, different program portfolios saw significant shifts.

The residential programs, for example, went from a TRC and PAC of 1.3 and 1.6 to 3.59 and 2.2 respectively and the Coupon Program actually saw TRC numbers in the double digits at 11.21. The IESO indicated that the reason for such a high TRC is the fact that LED light bulbs, which contribute to a majority of the savings in the Coupon Program, have a much longer effective useful life than CFLs. The useful life of an LED is equal to that of 3-4 CFLs and therefore creates significant operational and maintenance savings along with sustained energy savings. The combination of a long useful life with declining equipment costs results in a high TRC.

Several Business Programs such as Small Business Lighting and the Building Commissioning also scored low on both ratios but the overall program numbers were improved by the TRC and PAC numbers from the Retrofit and High Performance New Construction Programs. The IESO reported that the business programs saw lower cost-effectiveness numbers because of new avoided cost figures as well changes to the lighting measure baselines. Higher measure baselines have led to lower lifetime savings between the "base case" lighting measure and the "energy efficient" one. Given that incentive levels haven't changed in 2015, the combination of lower lifetime savings and static incentives meant lower cost-effectiveness numbers for the Business Programs.[51] The Industrial Programs portfolio was not cost-effective on the TRC but scored above 1 on the PAC. The numbers were similar to 2014. As the CFF programs ramp up, the TRC and PAC ratios can be expected to improve in the Industrial Programs if participation increases.

The other measurement that is used to understand the positive impact of conservation on the province is the levelized unit energy cost of delivering conservation. This compares the cost of delivering conservation to save a unit of power with the cost of generating the same unit of power. The levelized unit energy cost of conservation for 2015 is 3.5¢/kWh, which is slightly lower (less expensive per unit of energy saved) than the 2011-2014 figure of 3.7¢/kWh, and far more cost-effective than any other form of generation. As highlighted in Text Box 6.1.1, the cost of conservation is still less than conventional and renewable generation and therefore continues to be of good value to the province.

6.8 Results of IESO-Only Programs

In addition to the 2015-2020 Conservation First Framework, the IESO also delivers the Industrial Accelerator Program directly to the province's large transmission-connected customers, and also has responsibility for demand response programs. Since those programs are delivered directly to transmission-connected customers or will not have energy savings persisting to 2020, they naturally don't get counted towards LDC targets. These programs include the Industrial Accelerator Program (IAP) and the Capacity Based Demand Response Program. Table 6.7 details the performance of each of those IESO-only CDM programs in 2015.

Table 6.7. IESO-only CDM Program Performance in 2015

Program	Participation	Net 2020 Annual Energy Savings (MWh)	Net incremental Peak Demand Savings (MW)
Industrial Accelerator Program 1.0 and 2.0	16 projects	47,630	5.72
Capacity Based Demand Response	3 Aggregators	0	513
Residential and Small Commercial Demand Response*	290,053 Load Control Devices	0	172

*Note: The current status on this program's future is detailed in text box 6.8.3.

Source: IESO information provided to the ECO (21 March 2017).

6.8.1 Industrial Accelerator Program

The Industrial Accelerator Program (IAP) provides financial incentives to large transmission-connected customers to invest in energy saving innovative processes and retrofits that will allow the facilities to save electricity and/or switch consumption from peak hours. The IAP now includes four different initiatives that companies can participate in, all of which are similar to initiatives delivered by LDCs to distribution-connected customers:

- Retrofit
- Process and Systems
- High Performance New Construction
- Energy Managers (recently introduced)

The IAP doubled the number of projects in 2015 to 16 projects compared to the 2014 participation.[52] The increase in the number of projects also led to an increase in first year energy savings to 49 GWh and first year peak demand savings of 5.7 MW in 2015. These savings are a start to the June 2015 to December 2020 IAP 2.0 target of 1.7 TWh. However, that number remains dismally short of that target (only 3%).

By the end of 2015, the Industrial Accelerator Program had provided incentives to 36 energy efficiency projects resulting in total savings of 158 GWh. While program savings specific to 2015 were lower than forecasted the IESO has been making changes to increase participation through to 2020. Results could grow if IAP projects in the pipeline, particularly BMG projects, proceed to completion. The IESO's initial forecast is that BMG projects under the IAP will lead to energy savings of 0.66 TWh, which includes 0.29 TWh of natural gas combined heat and power projects and 0.37 TWh from waste-energy recovery projects.[53]

Since 2014, two major announcements have been made in an effort to increase participation in the IAP. Through a July 25, 2014 Ministerial Direction, the program, initially set to run until June 2015, has now been extended to December 31, 2020 to give customers the continued opportunity to participate in longer-term projects, matching the CFF timeframe. This IAP 2.0 framework has a new incremental energy savings target of 1.7 TWh in 2020 energy savings.[54]

Also, on December 16, 2016, the Minister of Energy issued a Direction that allowed transmission-connected customers with LDC-connected sites to participate in the IAP through the IESO. Any electricity savings accrued at the LDC level will be counted towards the LDC's CFF targets. The IESO will also undertake a pay-for-performance pilot for customers who are eligible for the IAP similar to the centrally-delivered multi-distributor CDM program, discussed in Text Box 6.11.2.[55]

6.8.2 Capacity Based Demand Response

As mentioned earlier, the IESO is now responsible for demand response (DR) targets in the province and has already transitioned the Demand Response 2 and Demand Response 3 programs to the Capacity Based Demand Response (CBDR) Program in March 2015. As contracted MWs in this program expire they are included in the annual DR auction and opened up to competition from existing and new providers. The

The 2016 auction saw the clearing price drop to 24% less than historical prices.

peaksaver PLUS program is also in the process of transitioning into an IESO administered market based structure, once funding stops at the end of 2017. More information on the peaksaver PLUS program is provided in Text Box 6.8.3.

The IESO launched its first DR auction in December 2015, where DR was procured for the summer commitment period (May-October 2016) and the winter commitment period (November 2016-April 2017). A subsequent auction was held in December of 2016. The clearing price for the 2015 auction was 11% less than the historical contract cost from the DR 3 program, and the 2016 auction saw the clearing price drop to 24% less than historical prices. Since the auction has been introduced, participation has also increased from 6 to 21 registered auction participants, which is a commendable effort from the IESO in garnering participation. The DR auction market has also allowed the IESO to conduct a pilot for large customers which explores capabilities of varying consumption throughout the day, traditionally offered by generators, to meet changing demand conditions.

The 2016 DR Auction cleared 455.2 MW for the 2017 summer commitment period (May 1 to Oct 31) and 477.5 MW for the 2017-18 winter commitment period (Nov 1, 2017 to April 30, 2018). Another 159 MW of DR capacity remains contracted through the CBDR, both of which can dispatch during times of peak demand.[56] The IESO activated the CBDR once in 2016 which lasted for four hours. The 159 MW is set to expire in two tranches over the course of 2018, at which time the MW will be added to the DR Auction target. As noted, the current CBDR program is considered a transitional program as it moves to incorporate these participants into its existing DR auction to compete against other providers of DR capacity and other types of resources such as generators and importers to meet Ontario's capacity in the future incremental capacity auction.

Ontario is aiming to use DR (including price-based initiatives such as the Industrial Conservation Initiative) to meet 10% of peak demand by 2025, equivalent to approximately 2,400 MW under forecast conditions. Table 6.8 details the peak demand savings from DR activities in 2015. The 711 MW savings in 2015 represents 30% of the 2,400 MW forecasted peak demand savings in 2025 target (pricing policies to reduce peak demand also count towards this target; taking these measures into account, total progress towards the 2,400 MW target was 1,872 MW at the end of 2015, 78% of the target). There were no CBDR activations in 2015 – peak demand savings are based on an evaluation of what level of demand reduction would be provided if called upon.

Table 6.8. Demand Response Savings in 2015

Demand Response Program in 2015	Net 2015 Annual Peak Demand Savings at the Generator Level (MW)
IESO Capacity Based Demand Response Program	526.2
LDC Delivered Residential and Small Commercial Demand Response Program	180.9
Total	**710.6**

Source: IESO information provided to the ECO (21 March 2016).

6.8.3 peaksaver PLUS: the Latest

In the March 31, 2014 Direction from the Minister of Energy, the IESO was directed to transition all DR activities, including the peaksaver PLUS program, to an IESO-administered DR program. In the 2011-14 CDM Framework, peaksaver PLUS devices were part of the Residential Demand Response Program and allowed the province to curtail energy demand during peak periods on extremely hot summer days, thus reducing the need to rely on more generation.[57] Until the transition was completed, the IESO's mandate was to continue to make the program available to LDCs and their interested customers.[58] After conducting stakeholder consultations to consider the future role and treatment of the peaksaver PLUS program in January 2016, the IESO confirmed that it would not fund new installations past December 31, 2015.[59] Currently, the IESO is continuing to maintain the program for existing devices and LDCs will continue to receive funding for maintenance of currently enrolled devices.

The peaksaver PLUS program is now set to discontinue by the end of December 2017. The IESO is currently working with the Conservation Residential Working Group to wind down the program. Another IESO working group, the Demand Response Working Group, continues to work with stakeholders to transition peaksaver PLUS to the DR auction market. In 2016, through the Demand Response Working Group, the IESO worked with stakeholders to enable residential DR participation in the IESO-administered market as an hourly DR resource, which became effective in May 2017. In July 2017, the IESO has proposed to stakeholders that the DR Auction target capacity should be increased over a three-year period to facilitate the transition of peaksaver resources to the DR auction market.

The peaksaver PLUS program had seen moderate success throughout the 2011-2014 CDM Framework, with over 300,000 installed devices. With the LDCs no longer responsible for DR targets, the devices are currently sitting idle in customers' homes and turning into stranded assets for the LDCs. The IESO has indicated that transitioning peaksaver to the DR auction will allow new technologies and participants an opportunity to participate and compete on a level-playing field with other types of DR. However, the transition of peaksaver to DR auction will likely not be a 1MW to 1MW transition due to the more demanding requirements from the DR Auction. The ECO will be monitoring the progress of peaksaver PLUS in the DR auction market for future reporting purposes.

6.9 Local/Regional Programs under the Conservation First Framework

Under the 2011-2014 CDM Framework, only one LDC, Powerstream (now Alectra) was able to receive approval from the OEB for a single local program. The Business Refrigeration Incentive Program, launched in late 2013, saw over a thousand businesses participate in the program. According to LDCs, this low application and approval rate was due to the difficult OEB approvals process, and an overly stringent interpretation of the requirement that new programs not "duplicate" existing programs. There were two other LDCs who applied for local programs to the OEB.

Both Hydro One and Toronto Hydro had applied separately for a suite of local CDM programs, but due to the requirement of the CDM Directive that Board-approved programs and OPA programs do not duplicate one another, as well as requirements of the Board's CDM Code, Hydro One withdrew its application. Toronto Hydro received approval for some of its programs, but choose not to proceed with them as it viewed the approved rate-payer funding to be insufficient.[61]

Many more innovative new conservation programs and pilots are moving forward.

The 2015-2020 Conservation First Framework has shifted the responsibility of approving local and regional programs from the OEB to the IESO. LDCs can now bring forward business cases for local or regional programs as part of their CDM plans or on an on-going basis. The IESO has developed guidelines for avoiding duplication with provincial programs, program innovation guidelines and an established timeline for program approvals.[62] Tables 6.9 and 6.10 list the local/regional programs and pilots that were approved by the IESO in 2015, 2016 and the first part of 2017. Many more innovative new conservation programs and pilots are moving forward under the new Framework.

Table 6.9. LDC Local and Regional Programs under the Conservation First Framework

Program Name	LDC(s)
Adaptive Thermostat	Toronto Hydro-Electric System Limited; Enbridge Gas Distribution;
Business Refrigeration Incentives	Alectra Utilities Corporation;* COLLUS PowerStream Corp.; Toronto Hydro-Electric System Limited;
Conservation on the Coast Low Income	Attawapiskat Power Corporation; Fort Albany Power Corporation; Kashechewan Power Corporation;
Conservation on the Coast Small Business Lighting	Attawapiskat Power Corporation; Fort Albany Power Corporation; Kashechewan Power Corporation;
First Nations Conservation	Hydro One Networks Inc.;
High Efficiency Agriculturual Pumping	Hydro One Networks Inc.; Niagara Peninsula Energy Inc.;
Instant Savings	Algoma Power Inc.; Bluewater Power Distribution Corporation; Canadian Niagara Power Inc.; Entegrus Powerlines Inc.; Essex Powerlines Corporation; Westario Power Inc.;
OPsaver	Oakville Hydro Electricity Distribution Inc.; Toronto Hydro-Electric System Limited;
PUMPsaver	Oakville Hydro Electricity Distribution Inc.; Toronto Hydro-Electric System Limited;
Smart RT for Small and Mid-Size Business	Toronto Hydro-Electric System Limited;
Social Benchmarking**	Alectra Utilities Corporation; COLLUS PowerStream Corp.; Hydro One Networks Inc.; Hydro Ottawa Limited; Toronto Hydro-Electric System Limited;
Swimming Pool Efficiency	Burlington Hydro Inc.; Halton Hills Hydro Inc.; Hydro Ottawa Limited; Milton Hydro Distribution Inc.; Oakville Hydro Electricity Distribution Inc.; Renfrew Hydro Inc.; Toronto Hydro-Electric System Limited;

* Alectra Utilities Corporation is formerly: 1) Enersource Hydro Mississauga Inc.; 2) Horizon Utilities Corporation; 3) Hydro One Brampton Networks Inc.; & 4) PowerStream Inc;

** Social Benchmarking is also known as: 1) Home Energy Report; 2) Social Benchmarking and Utility E-Commerce; 3) Behavioural Savings; 4) Residential Engagement Platform; or 5) Home Energy Savings

Source: IESO

Table 6.10. LDC Innovation Fund Pilots under the Conservation First Framework

Pilot Name	LDC(s)
Residential Direct Mail Pilot Program	Canadian Niagara Power Inc., Algoma Power Inc.
Home Energy Assessment & Retrofit Pilot Program	Customer First
Small & Medium Business Energy Management System Innovation Pilot	Kitchener-Wilmot Hydro Inc.; Energy+ Inc.
Truckload Events	Enersource Hydro Mississauga Inc.
Intelligent Air Technology	EnWin Utilities Ltd.
Residential Ductless Heat Pump/Financing	EnWin Utilities Ltd.
ECM Furnace Fan Residential Upstream Pilot	Horizon Utilities Corporation, Toronto Hydro-Electric System Limited, Kitchener-Wilmot Hydro Inc.
Solar Powered Attic Ventilation Research Oriented Pilot	Hydro One Brampton
Integration of Smart Thermostat with Dynamic Electricity Pricing and Customer Feedback	Hydro One Networks Inc.
Air Source Heat Pump – For Residential Water Heating	Hydro One Networks Inc.
Air Source Heat Pump – For Residential Space Heating	Hydro One Networks Inc.
Low-Income Air Source Heat Pump Pilot	Hydro One Networks Inc.
Hotel/Motel in-suite A/C upgrades	Niagara Peninsula Energy Inc.
Advanced Roof Top Unit (RTU) Control Pilot	Toronto Hydro-Electric System Limited
Toronto Hydro – Enbridge Joint Low-Income Program Pilot	Toronto Hydro-Electric System Limited, Enbridge Gas Distribution
Electronics Take Back Pilot	Toronto Hydro-Electric System Limited
Data centre pilot	Toronto Hydro-Electric System Limited
P4P for Class B Office (Op saver)	Toronto Hydro-Electric System Limited
Hydronic Balancing (Pumpsaver)	Toronto Hydro-Electric System Limited
Residential Direct Install	Westario Power Inc.

Source: IESO

6.10 IESO Conservation Fund Programs

The IESO's Conservation Fund has an annual budget of $9.5 million. Since 2005, this fund has supported over 200 innovative energy projects across Ontario. Funding is available for a three-year period proportional to the total investment needs of the project and is offered to LDCs, technology companies, consulting firms, universities and colleges, and the public sector.

The fund considers initiatives that are developing or piloting innovative conservation programs and practices to bring about market transformation on a large-scale basis.[63] Recipients of the Conservation Fund do not have to be LDCs. Table 6.11 lists the Conservation Fund Pilots that were delivered in 2015, listing their performance and funds allocated.

Table 6.11. Conservation Fund Pilots Delivered in 2015

Program	Participation	Funding ($)	Net 2020 Annual Electricity Savings (MWh)	Peak Demand Savings (MW)	Program Administrator Cost (PAC)	Total Resource Cost (TRC)
EnerNOC Pilot	12 Projects	214,000	0	0	0.02	0.02
Loblaws P4P Pilot	18 Projects	561,333	8,311	0.73	2.91	1.02
Strategic Energy Group Pilot	10 Projects	153,044	0	1.06	0.66	0.76
Social Benchmarking Pilot	150,258 Participants	1,007,425	0	1.65	n/a	n/a
Other Conservation Fund Pilots	n/a	4,850,560	n/a	n/a		

Source: IESO

In terms of cost-effectiveness, the EnerNOC and Strategic Energy Group pilots did not meet the cost-effectiveness threshold of 1. The IESO's evaluator indicated that the main reasons for the low figures are due to the fact that the programs are new, so participation was low and savings achieved were minimal.[64] The Loblaws P4P Pilot, on the other hand, had strong results for both the PAC and the TRC, with the PAC test result surpassing that of the province-wide Retrofit Program.[65] The model that was used for Loblaws is now being replicated in the IESO's P4P Large Customer Multi-Utility Program, and it will be interesting to see if the success of the pilot can be reproduced on a larger scale.

Table 6.12 lists the initiatives that have been approved by the IESO under the Conservation Fund in 2016.

Table 6.12. Conservation Fund Pilots under the Conservation First Framework

Program	Proponent Company/ Organization	Funding Awarded
Enhancement of RETScreen Expert to further meet needs of Ontario Energy professionals	CanmetENERGY	$400,000
Intelligent MURB Energy Management Systems	SensorSuite	$498,250
Pay-for-Performance Pilot	Ontario Clean Water Agency	$1,000,000
Advantage Power Pricing Evolution	Powerstream	$999,000
Residential Solar Storage Pilot	Powerstream	$500,000
Hydraulic Air Compressor Demonstrator Project	Electrale Innovation Ltd	$499,000
Bills that Save	BEworks Inc	$450,000
Advancing Energy Efficient Water Services in Toronto	Toronto Water	$100,000
Local Achievable Potential Study Allocation	Multiple LDCs	$1,000,000
High Performance Buildings Program II	National Research Council Canada	$2,000,000

Retscreen is clean energy management software system for a variety of energy performance analyses. It has been developed by Natural Resources Canada.

Source: IESO information provided to the ECO (21 March 2017)

6.11 2016 Policy Developments Affecting Electricity Conservation Programs

6.11.1 Minister of Energy's Direction on Province-Wide Program Availability

On December 16, 2016, the Minister of Energy issued a Direction to the IESO that included instructions regarding the availability and delivery of province-wide programs by LDCs to their customers. The Direction required LDCs that were not delivering all province-wide CDM programs to resubmit revised CDM plans by May 1, 2017 outlining how they plan to deliver all approved programs in their service territories. Furthermore, if an LDC decided not to deliver a province-wide program, then the IESO would deliver the program in the LDC's jurisdiction and the associated electricity savings would not be counted towards the LDC's target. This Directive differed from the original direction that established the Conservation First Framework and gave LDCs the flexibility to deliver province-wide programs in their service areas as they deemed appropriate and reasonable. It suggests that, in the Minister's view, this element of the Framework was unduly limiting customer access to some conservation programs, and required corrective action.

The IESO has informed the ECO that it received 32 revised CDM plans and notification from three others indicating which province-wide programs they plan to deliver. LDCs who provided notifications could not submit revised CDM plans because of technical issues or merger activities. The Minister of Energy also issued a letter on June 23 to extend the deadline to August 1, 2017 for LDCs to submit revised CDM plans.

While most LDCs are planning to deliver all province-wide programs, some LDCs have already revised their CDM plans to drop LDC delivery of some province-wide programs. The PSU-Monitoring and Targeting Program (Industrial), the Existing Building Commissioning Program (Business) and both the Business and Residential New Construction Programs (Business and Residential) were omitted from several revised CDM plans. The IESO is planning to deliver those programs in those service territories to fill in the program gaps by the end of 2017.

6.11.2 Minister's Direction on New Province-Wide Programs

In June 2016, the Minister directed the IESO to centrally design and deliver, in consultation with distributors, a province-wide pay-for-performance program for large multi-distributor consumers and a province-wide whole home pilot program for residential customers. Any electricity savings from these two programs will be counted towards LDC targets. The IESO, where appropriate, was directed to coordinate program delivery with the gas distributors. The IESO held multiple webinars and received written feedback as it developed the two programs throughout 2016 and into 2017. The two final programs are described below.

The Energy Performance Program for Multi-Distributor Customers

The program was launched in December 2016 and encourages whole building energy performance improvements for large customers who have several locations in multiple LDC service territories. Customers are paid incentives at four cent per kilowatt-hour (kWh) of savings per year for up to four years. Participants are encouraged to make behavioural and operational changes along with capital investments to achieve and grow their electricity savings over the course of the initiative. Eligible customers must have locations in two or more LDC service territories and have an annual consumption (single or aggregate) of at least 1,500,000 kWh, amongst other eligibility criteria. To date, 1 single customer has enrolled 76 buildings across the province in the program.[66]

The pilot program is expected to integrate electricity efficiency measures into Enbridge and Union Gas' existing home retrofit offerings.

The Whole Home Pilot for Residential Customers

The Whole Home Pilot program was launched in late May 2017 and is being delivered province-wide by Enbridge Gas Distirbution Inc. and Union Gas throughout the province. The pilot program is expected to integrate electricity efficiency measures into Enbridge and Union Gas' existing home retrofit offerings and offers a multi-fuel energy efficiency program. This one-stop multi-fuel whole home approach builds on the $100 million Ontario Government investment from the Green Investment Fund to make the Enbridge Gas and Union Gas programs province-wide and accessible to homes heated by natural gas, propane, oil and wood (more information regarding this funding is available in Section 5.2.1).

Customers will be offered incentives for retrofits and equipment upgrades through participation in home energy audits.[67] Electricity measures such as more efficient air conditioners and appliances as well as insulation and air sealing in electrically-heated homes, will be funded by the Conservation First Framework. The program is expected to run until the end of 2017 and include approximately 22,000 households.

6.11.3 OEB's RPP Roadmap

As previously recommended by the ECO, the OEB's plan to review the Regulated Price Plan (RPP), announced in late 2015, includes using time-of-use (TOU) prices to minimize long-term system costs.[68] In July of 2016, the OEB issued its RPP Roadmap: *Guidelines for Pilot Projects on RPP Pricing*, and invited LDCs to apply to the OEB to develop and implement price and non-price pilots. The pilots are expected to help the OEB assess various RPP options (e.g., alternative electricity rate structures) that may eventually be made available province-wide. To date, the OEB has received five RPP pilot applications (one is from a group of 7 LDCs represented by a consultant), and has approved two.[69]

The IESO has also received direction from the Minister of Energy in December 2016 to fund these RPP pilots through its Conservation Fund and to establish a streamlined approvals process to access funding. Apart from funding, the IESO will have no further role in these RPP pilots.

6.11.4 Mid-Term Review of the Conservation First Framework

As per the Minister's 2014 Direction that established the 2015-2020 Conservation First Framework and the 2015-2020 Energy Conservation Agreement, the IESO is required to complete a Mid-Term Review of the Framework by June 1, 2018. The IESO has established an advisory group of LDCs, vendors and customers to review various critical aspects of the framework including:

- targets and budgets;
- lessons learned on LDC funding models;
- customer needs;
- program effectiveness (including LDC and IESO services);
- conservation integration with regional planning;
- CFF alignment with Climate Change Action Plan (CCAP) initiatives;
- post-2020 approaches to energy efficiency; and,
- the definition of conservation.

The IESO will also undertake a broader stakeholder engagement process which will include LDCs, customer groups and various other interested agencies and associations in late 2017.

6.11.5 The IESO's Achievable Potential Study

One of the key inputs into the Mid-Term Review process is the IESO's *Achievable Potential Study* (APS) that was completed in mid 2016.[70] The purpose of the study is to provide the short-term electricity conservation potential achievable by 2020, which would feed into the Mid-Term Review process; and also to conduct a more long-term conservation analysis over a 20-year horizon (2015-2035). The APS includes an energy efficiency study and a behind-the-meter generation (BMG) study. This APS is different from the last one completed in early 2014 since it incorporated LDC-specific information into its analysis and produced results at both an LDC and province-wide level as well. In other words, the study used a bottom-up approach to assess the short- and long-term conservation potential of the province. The IESO's consultant gathered data from LDCs and reviewed OEB data to develop this study.

With respect to Ontario' short-term conservation goals, the study concluded that the achievable electricity savings (including BMG) under the 2015-2020 CFF is approximately 7.4 TWh based on the existing funding. This means that LDCs can collectively exceed the 7 TWh target that has been set by the province. The long-term APS study estimated that if incentive levels remain similar, the province has the potential to achieve 18 TWh of energy savings by 2035. If spending constraints and incentive caps are removed, that potential could rise to 29 TWh.

Along with influencing the mid-term review results, the APS will have an impact on the LDCs' Mid-Term Incentive threshold calculations to determine LDC performance incentives, as each LDC's MTI threshold is based primarily on the lesser of 50% of their CFF target or 50% of their APS target.[71]

Endnotes

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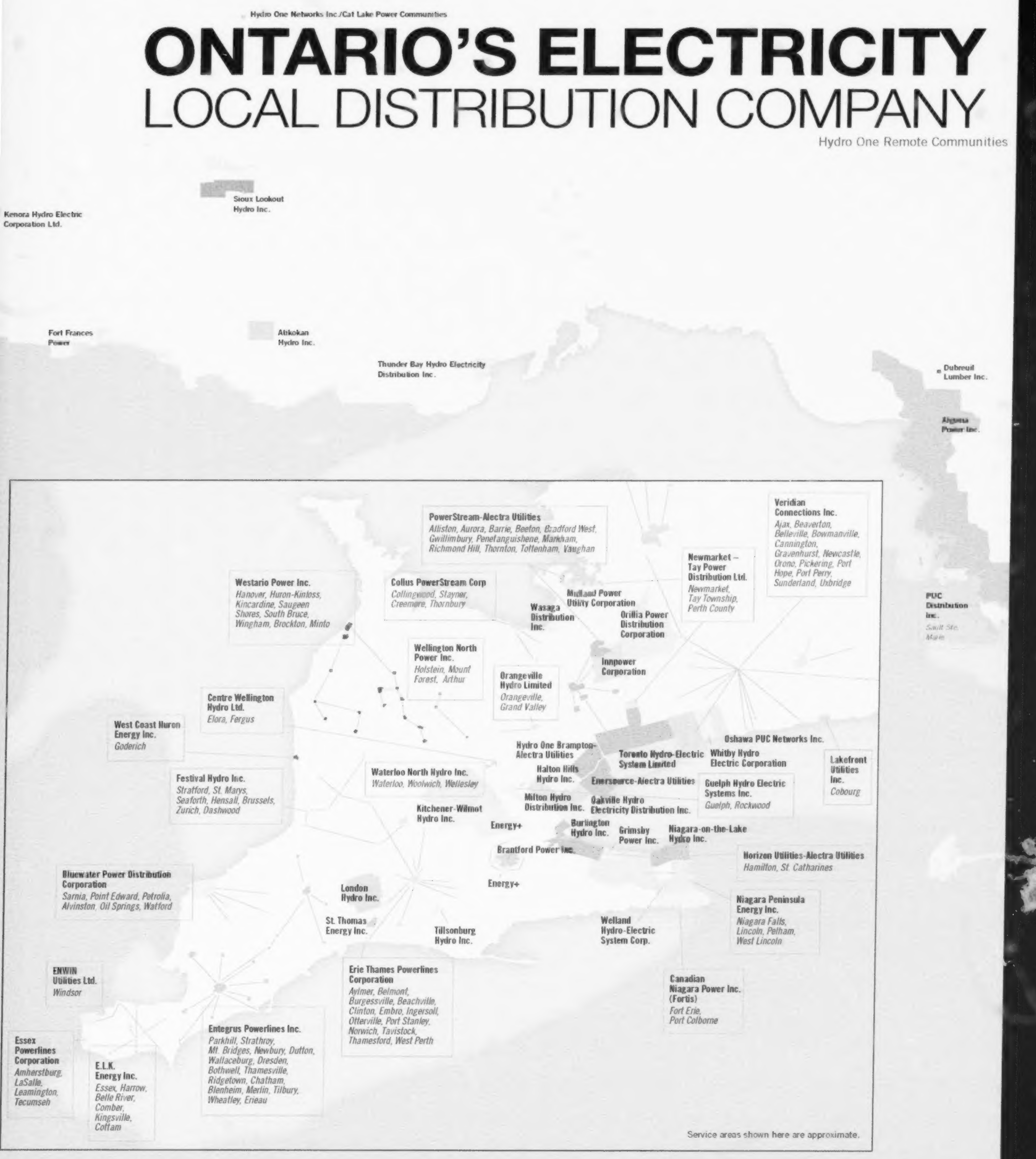
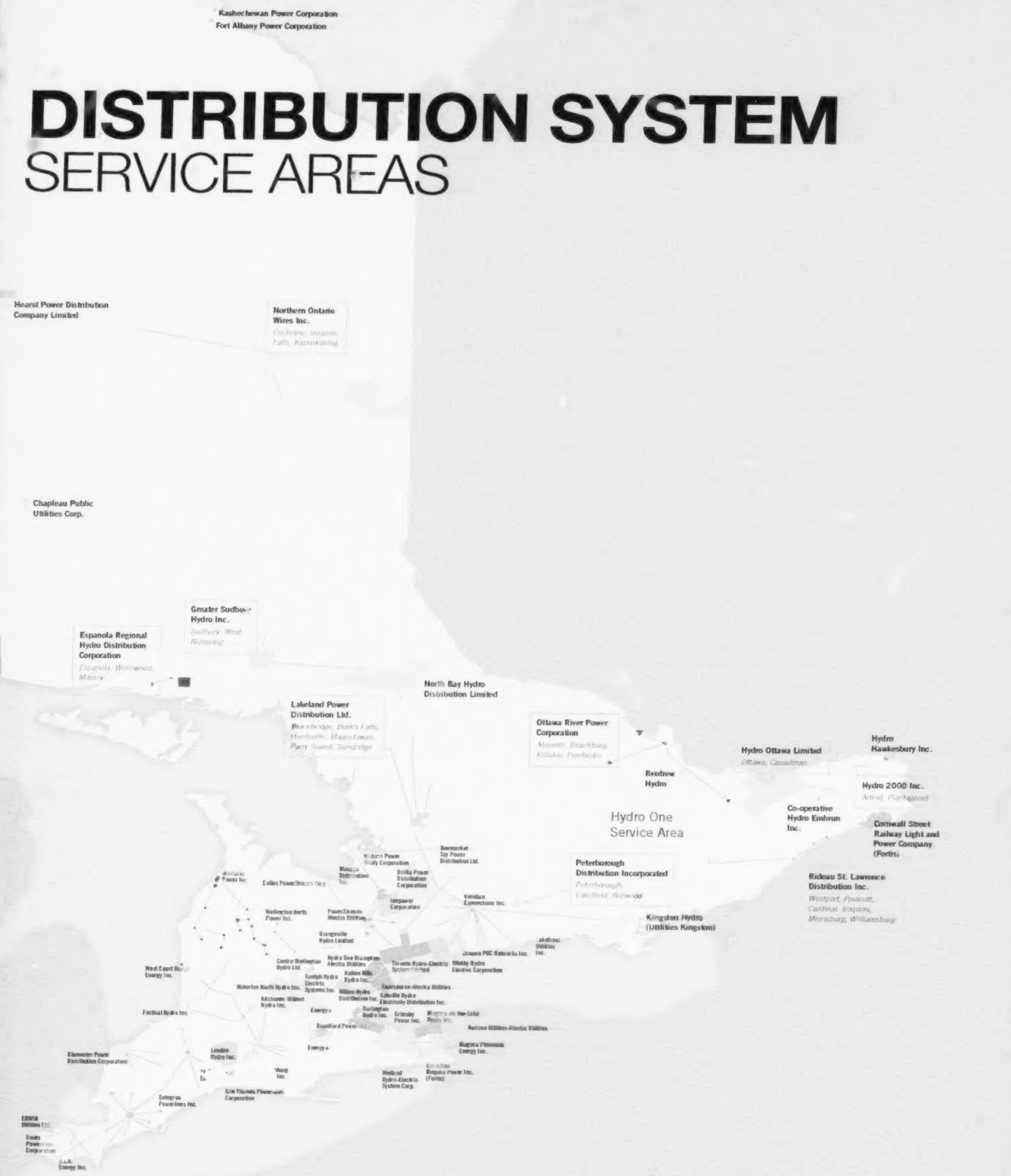
ONTARIO'S ELECTRICITY
LOCAL DISTRIBUTION COMPANY


Hydro One Networks Inc./Cat Lake Power Communities
Hydro One Remote Communities
Sioux Lookout Hydro Inc.
Kenora Hydro Electric Corporation Ltd.
Fort Frances Power
Atikokan Hydro Inc.
Thunder Bay Hydro Electricity Distribution Inc.
Dubreuil Lumber Inc.
Algoma Power Inc.
PUC Distribution Inc. Sault Ste. Marie
PowerStream-Alectra Utilities Alliston, Aurora, Barrie, Beeton, Bradford West, Gwillimbury, Penetanguishene, Markham, Richmond Hill, Thornton, Tottenham, Vaughan
Veridian Connections Inc. Ajax, Beaverton, Belleville, Bowmanville, Cannington, Gravenhurst, Newcastle, Orono, Pickering, Port Hope, Port Perry, Sunderland, Uxbridge
Newmarket – Tay Power Distribution Ltd. Newmarket, Tay Township, Perth County
Westario Power Inc. Hanover, Huron-Kinloss, Kincardine, Saugeen Shores, South Bruce, Wingham, Brockton, Minto
Collus PowerStream Corp Collingwood, Stayner, Creemore, Thornbury
Midland Power Utility Corporation
Wasaga Distribution Inc.
Orillia Power Distribution Corporation
Wellington North Power Inc. Holstein, Mount Forest, Arthur
Orangeville Hydro Limited Orangeville, Grand Valley
Innpower Corporation
Centre Wellington Hydro Ltd. Elora, Fergus
West Coast Huron Energy Inc. Goderich
Oshawa PUC Networks Inc.
Hydro One Brampton-Alectra Utilities
Toronto Hydro-Electric System Limited
Whitby Hydro Electric Corporation
Lakefront Utilities Inc. Cobourg
Waterloo North Hydro Inc. Waterloo, Woolwich, Wellesley
Halton Hills Hydro Inc.
Enersource-Alectra Utilities
Guelph Hydro Electric Systems Inc. Guelph, Rockwood
Festival Hydro Inc. Stratford, St. Marys, Seaforth, Hensall, Brussels, Zurich, Dashwood
Milton Hydro Distribution Inc.
Oakville Hydro Electricity Distribution Inc.
Kitchener-Wilmot Hydro Inc.
Energy+
Burlington Hydro Inc.
Grimsby Power Inc.
Niagara-on-the-Lake Hydro Inc.
Brantford Power Inc.
Horizon Utilities-Alectra Utilities Hamilton, St. Catharines
Bluewater Power Distribution Corporation Sarnia, Point Edward, Petrolia, Alvinston, Oil Springs, Watford
London Hydro Inc.
Energy+
Niagara Peninsula Energy Inc. Niagara Falls, Lincoln, Pelham, West Lincoln
St. Thomas Energy Inc.
Tillsonburg Hydro Inc.
Welland Hydro-Electric System Corp.
ENWIN Utilities Ltd. Windsor
Erie Thames Powerlines Corporation Aylmer, Belmont, Burgessville, Beachville, Clinton, Embro, Ingersoll, Otterville, Port Stanley, Norwich, Tavistock, Thamesford, West Perth
Canadian Niagara Power Inc. (Fortis) Fort Erie, Port Colborne
Entegrus Powerlines Inc. Parkhill, Strathroy, Mt. Bridges, Newbury, Dutton, Wallaceburg, Dresden, Bothwell, Thamesville, Ridgetown, Chatham, Blenheim, Merlin, Tilbury, Wheatley, Erieau
Essex Powerlines Corporation Amherstburg, LaSalle, Leamington, Tecumseh
E.L.K. Energy Inc. Essex, Harrow, Belle River, Comber, Kingsville, Cottam

Service areas shown here are approximate.

DISTRIBUTION SYSTEM
SERVICE AREAS


Kashechewan Power Corporation
Fort Albany Power Corporation
Hearst Power Distribution Company Limited
Northern Ontario Wires Inc.
Cochrane, Iroquois Falls, Kapuskasing
Chapleau Public Utilities Corp.
Greater Sudbury Hydro Inc.
Sudbury, West Nipissing
Espanola Regional Hydro Distribution Corporation
Espanola, Webbwood, Massey
North Bay Hydro Distribution Limited
Lakeland Power Distribution Ltd.
Bracebridge, Burk's Falls, Huntsville, Magnetawan, Parry Sound, Sundridge
Ottawa River Power Corporation
Almonte, Beachburg, Killaloe, Pembroke
Hydro Ottawa Limited
Ottawa, Casselman
Hydro Hawkesbury Inc.
Renfrew Hydro
Hydro 2000 Inc.
Alfred, Plantagenet
Hydro One Service Area
Co-operative Hydro Embrun Inc.
Cornwall Street Railway Light and Power Company (Fortis)
Peterborough Distribution Incorporated
Peterborough, Lakefield, Norwood
Rideau St. Lawrence Distribution Inc.
Westport, Prescott, Cardinal, Iroquois, Morrisburg, Williamsburg
Kingston Hydro (Utilities Kingston)
Midland Power Utility Corporation
Newmarket Tay Power Distribution Ltd.
Wasaga Distribution Inc.
Orillia Power Distribution Corporation
Westario Power Inc.
Collus PowerStream Corp.
Innpower Corporation
Veridian Connections Inc.
Wellington North Power Inc.
PowerStream-Alectra Utilities
Orangeville Hydro Limited
Lakefront Utilities Inc.
Oshawa PUC Networks Inc.
West Coast Huron Energy Inc.
Centre Wellington Hydro Ltd.
Hydro One Brampton-Alectra Utilities
Toronto Hydro-Electric System Limited
Whitby Hydro Electric Corporation
Guelph Hydro Electric Systems Inc.
Halton Hills Hydro Inc.
Waterloo North Hydro Inc.
Enersource-Alectra Utilities
Milton Hydro Distribution Inc.
Oakville Hydro Electricity Distribution Inc.
Kitchener-Wilmot Hydro Inc.
Energy+
Burlington Hydro Inc.
Grimsby Power Inc.
Niagara-on-the-Lake Hydro Inc.
Festival Hydro Inc.
Brantford Power Inc.
Horizon Utilities-Alectra Utilities
Energy+
Niagara Peninsula Energy Inc.
Bluewater Power Distribution Corporation
London Hydro Inc.
burg Inc.
Canadian Niagara Power Inc. (Fortis)
Welland Hydro-Electric System Corp.
Erie Thames Powerlines Corporation
Entegrus Powerlines Inc.
ENWIN Utilities Ltd.
Essex Powerlines Corporation
E.L.K. Energy Inc.

Source: Independent Electricity System Operator.

Key Conservation Players in Ontario

Ontario Ministry of Energy[1] is responsible for:

- Developing the Long-Term Energy Plan with a mandate to place conservation first.
- Overseeing the electricity and natural gas conservation frameworks, and providing direction to the IESO and OEB as needed.
- Developing conservation initiatives to complement those of electric LDCs and gas distributors.

Ontario Ministry of the Environment and Climate Change is responsible for:

- Implementing the Climate Change Action Plan with the aim of achieving the province's greenhouse gas emissions reductions targets.
- Establishing Ontario's green bank (Green Ontario Fund), an organization mandated to reduce market barriers to low-carbon technologies, which may fund or deliver conservation initiatives.

Ontario Energy Board (OEB) is responsible for:

- Overseeing and regulating energy companies in the public interest, including setting rates for electric LDCs and gas distributors.
- Establishing the natural gas conservation framework, approving gas distributor conservation plans, and evaluating their conservation program results.
- Establishing conservation guidelines and license conditions for electricity distributors, and reporting on LDC progress towards their conservation targets.

Independent Electricity System Operator (IESO) is responsible for:

- Managing and planning Ontario's electricity system.
- Procuring electricity resources, including demand response to reduce peak demand in the province.
- Overseeing the 2015-2020 Conservation First Framework, including:
  - Working with LDCs to design and deliver conservation programs;
  - Reviewing and approving LDC conservation plans;
  - Evaluating conservation program results and reporting on LDCs' target progress.
- Designing and delivering conservation programs for large transmission-connected customers.

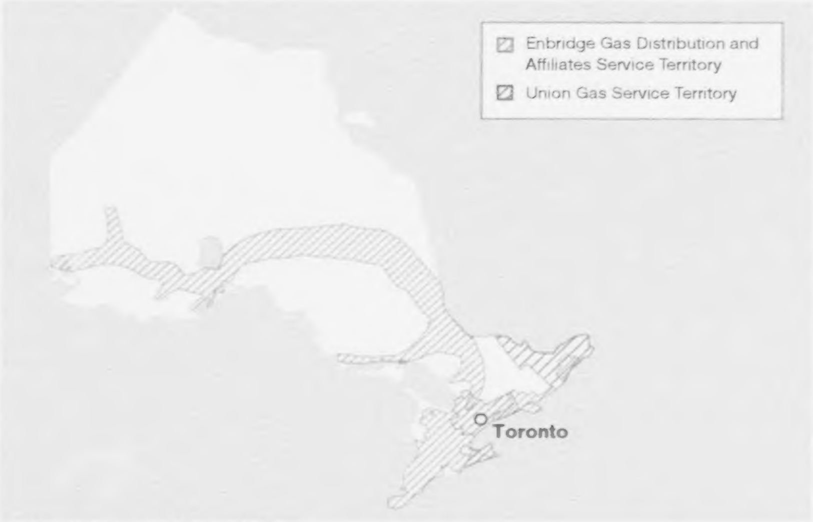
Local Distribution Companies (LDCs) are responsible for:

- Distributing electricity from the province's transmission lines to homes, businesses aand industries (see map on previous page).
- Working with the IESO to design and deliver electricity conservation programs to their customers.

Natural Gas Utilities are responsible for:

- Distributing natural gas to homes, businesses and industries.
- Delivering natural gas conservation programs to customers, as part of their OEB-approved conservation plans.

Natural Gas Distributor Franchise Areas


▨ Enbridge Gas Distribution and Affiliates Service Territory
▨ Union Gas Service Territory
Toronto

Source: Enbridge Gas Distribution

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[1] Other Ontario Ministries (e.g., Transportation, Municipal Affairs, Education) also have roles in conservation as it relates to their core mandates (e.g., Municipal Affairs is responsible for the energy conservation requirements in the Ontario Building Code).

Guide to Energy Units and Conversion Factors

Joule A common unit of energy that can be used to compare different energy sources, for example cubic metres of natural gas (m^3), litres of gasoline, and kilowatt-hours of electricity (kWh).

A joule of energy is used when lifting an apple about 1 metre, or raising the temperature of one kilogram of water by about 0.24 degrees Celsius.

1 m^3 of natural gas = 37,313,433 joules (37 MJ)
1 kWh = 3,600,000 joules (3.6 MJ)
1 litre of gasoline = 32,040,000 joules (32 MJ)

Measuring Various Energy Uses

Activity	Approximate Amount of Energy	
	Customary Units	Joules
Using an LED reading lamp for 1 hour	6.3 Wh	22.7 kJ
Watching a flat screen television for 1 hour	100 Wh	360 kJ
Running an electric clothes dryer for 1 hour	2.8 kWh	10 MJ
Amount of energy in a propane barbecue cylinder	17 L	500 MJ
Amount of energy in a compact car's gasoline tank	30 L	1 GJ
Average Ontario monthly household electricity use	750 kWh	2.7 GJ
Average Ontario annual household natural gas use	2,389 m^3	92 GJ
Ontario solar electricity generation in 2015	2.8 TWh	10.1 PJ
Annual electricity use of the province in 2015	137.2 TWh	494 PJ

Prefixes for Units of Measurement

Prefix	Quantity
kilo (k)	Thousand (1,000 or 10^3)
mega (M)	Million (1,000,000 or 10^6)
giga (G)	Billion (1,000,000,000 or 10^9)
tera (T)	Trillion (1,000,000,000,000 or 10^{12})
peta (P)	Quadrillion (1,000,000,000,000,000 or 10^{15})

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